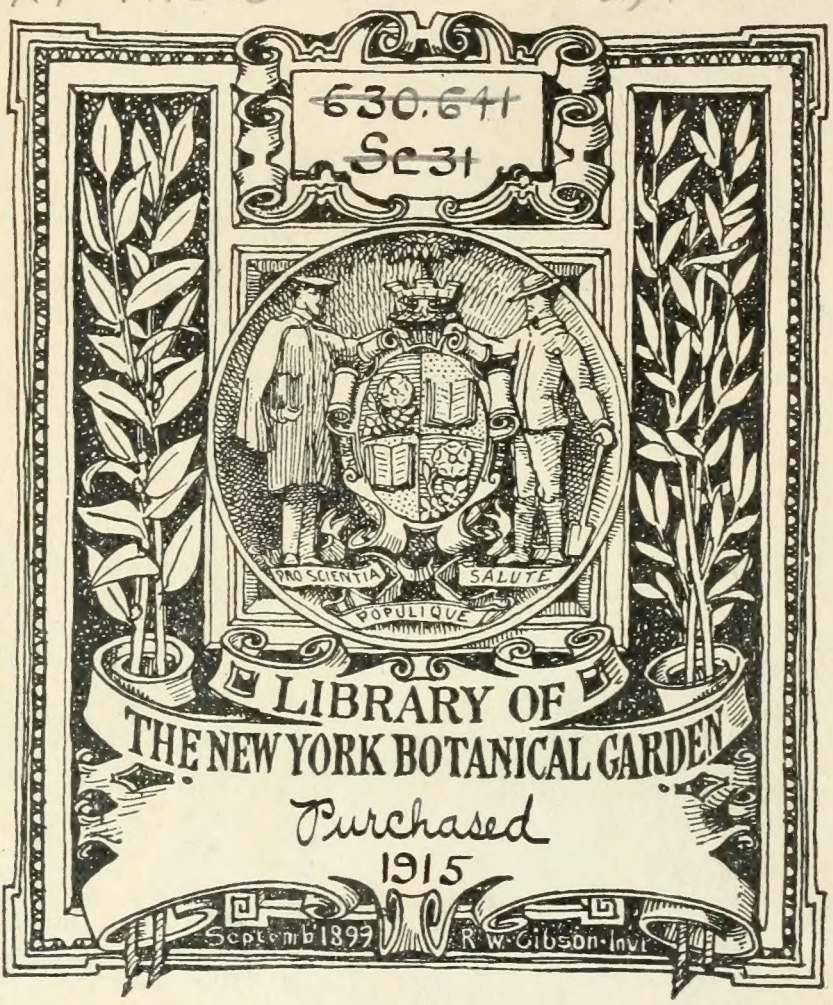
XT .R336 4th ser. v. 12, 1880.

~~630.641~~
~~Se31~~



TRANSACTIONS

OF THE

HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND

WITH

AN ABSTRACT OF THE PROCEEDINGS AND THE PREMIUMS OFFERED BY THE SOCIETY IN 1880.

PUBLISHED ANNUALLY.

LIBRARY
NEW YORK
BOTANICAL
GARDEN.

FOURTH SERIES.

VOL. XII.

EDITED UNDER THE SUPERINTENDENCE OF FLETCHER NORTON MENZIES, SECRETARY TO THE SOCIETY.

EDINBURGH:
WILLIAM BLACKWOOD & SONS, 45 GEORGE STREET,
AND 37 PATERNOSTER ROW, LONDON.
1880.

.R336
Helen.
V.12
1880

HIGHLAND AND AGRICULTURAL SOCIETY.

General Meetings of the Society are held in January and June or July.

The Directors meet on the first Wednesday of each month, from November to June inclusive.

All applications for Grants in aid of District Shows must be lodged with the Secretary before 1st November for competition the year following.

WORKS ON AGRICULTURE, &c.

JOURNAL OF AGRICULTURE, AND TRANSACTIONS OF THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

Second Series, 1828 to 1843, 21 vols., bound in cloth, £3, 3s.

Third Series, 1843 to 1865, 22 vols., bound in cloth, £4, 4s.

INDEX TO THE FIRST, SECOND, AND THIRD SERIES OF THE TRANSACTIONS OF THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND FROM 1799 TO 1865. Cloth, 5s.

TRANSACTIONS OF THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND. Fourth Series, 1866–71, 6 numbers, sewed, 4s. each; 1872–80, 9 volumes, cloth, 5s. each, published annually.

REPORT ON THE PRESENT STATE OF THE AGRICULTURE OF SCOTLAND, arranged under the auspices of the Highland and Agricultural Society. Presented at the International Agricultural Congress at Paris in June 1878. Cloth, 5s.

DICTIONARIUM SCOTO-CELTICUM: A Dictionary of the Gaelic Language, in two volumes. Compiled and published under the direction of the Highland Society of Scotland, 1828. Bound in cloth, £7, 7s.; 6 copies on extra paper, £10, 10s.

MANUAL OF AGRICULTURE, including the application thereto of Chemistry, Geology, Botany, Animal Physiology, and Meteorology. By RICHARD HENDERSON. Prize Report, published under the auspices of the Society. Cloth, 1s. 6d.

PRACTICAL REMARKS ON AGRICULTURAL DRAINAGE. By WILLIAM W. HOZIER of Tannochside. Prize Report, published under the auspices of the Society, 1870. Cloth, 1s.

HUMANITY TO ANIMALS, being Extracts from Prize Essays on the most effectual method of inculcating that duty in Elementary Schools. Published under the auspices of the Society. Sewed, 3d.

The above Works can be had on application to WILLIAM BLACKWOOD & SONS, *15 George Street, Edinburgh; and 37 Paternoster Row, London.*

Recently Published, 600 pp., demy 8vo, price 16s.,

HISTORY OF THE HIGHLAND & AGRICULTURAL SOCIETY OF SCOTLAND,

WITH

NOTICES OF ANTERIOR SOCIETIES FOR THE PROMOTION OF AGRICULTURE IN SCOTLAND.

BY

ALEXANDER RAMSAY.

Published for the Author by WILLIAM BLACKWOOD & SONS, Edinburgh and London.

OPINIONS OF THE PRESS.

THE AGRICULTURAL GAZETTE.—It is not only an accurate catalogue of the strictly Society performances through its meetings, *Transactions*, prizes, journals, office-bearers, but a true history of national agricultural improvement; and the whole is laid before the reader with great literary skill. The history is no mere catalogue of events. It is a living picture in which quaint humours, local interests, individual memoirs, mingling with the account of public services and natural results, have been sketched by a true artist. The book is thus not only useful as a work of reference to any one interested in national progress—it is admirable reading on its own account, and we cannot imagine a better book for the library of the tenant farmer.

NORTH BRITISH AGRICULTURIST.—In a very handsomely got up volume of 600 pages, Mr Alexander Ramsay of the *Banffshire Journal* gives a minute and very carefully compiled history of a Society which has, for the greater part of a century, been intimately associated with the progress of Scottish agriculture. Within the limits of no other volume can agriculturists acquire so much information regarding the ups and downs of the foremost Scotch herds, studs, and flocks. Nowhere else are the advent before the public, the career in that crucial arena, and the withdrawal from competition, of the leading herds, flocks, and studs in Scotland, during the present century, so fully recorded as in the 250 odd pages descriptive of the general shows of the Society.

THE FARMER.—Mr Ramsay, we think, has found a true mean in this difficult effort of authorship. In a volume of 600 pages he has recorded all that it is desirable or possible to know of the history and progress of the Highland and Agricultural Society within such convenient compass, and this has been done in a pleasant style throughout, under which the reader is constantly finding history of the highest kind passing before his eye, either directly or suggestively; while, as the general result, a flood of light is thrown on the amazing progress of agriculture in the Highlands and Lowlands of Scotland during the last hundred years. The Highland Society may well be congratulated on the publication of this work. It is a book which agriculturists in all parts of the world cannot fail to read with much interest.

LIVE STOCK JOURNAL.—The publication of this volume supplies an important link in the history of agricultural progress, and is a valuable contribution to agricultural literature.

CHAMBER OF AGRICULTURE JOURNAL.—Mr Ramsay has succeeded in producing what must be to all agriculturists in the three kingdoms an extremely interesting and instructive volume.

MARK-LANE EXPRESS.—A valuable contribution to the chronicles of agriculture.

THE FIELD.—The book is well written, and will be read by all who are interested in Scottish agriculture.

JOURNAL OF FORESTRY AND ESTATES MANAGEMENT.—This valuable work which we can confidently recommend to the notice of our readers as well worthy of their perusal.

IRISH FARMERS' GAZETTE.—The preparation of so elaborate a work, all the details of which are taken from the actual records of the Society, must have entailed an immense amount of labour; but Mr Ramsay evidently had his heart in the work, and he has succeeded in producing a volume which is a monument of his industry and talent, as well as of the important features of that great Society the history of which he has recorded. It has been the fashion of late years amongst certain would-be advanced agriculturists in Scotland to decry and disparage the Highland and Agricultural Society, and Mr Ramsay has supplied the best argument against such persons in his faithful description of the vast benefits which the Society has conferred on Scotland, including those very individuals who are so ready to cast blame upon the Society, simply because it will not adopt their extreme views on certain points. Mr Ramsay's book is a most valuable addition to agricultural literature, and as such we heartily commend it to our readers.

DUNDEE ADVERTISER. The methodical arrangement for reference is excellent, and the painstaking research and literary ability exhibited throughout the volume are creditable to the industry and culture of the author. The book is a mine of wealth on matters relating to the Society. It will be invaluable to the farmers of Scotland and agriculturists everywhere.

EDINBURGH DAILY REVIEW. —Mr Ramsay has done substantial service to the cause of agriculture by thus enriching its literature.

EDINBURGH COURANT. —An exhaustive history of the Society. In the admirably condensed survey [of the state of agriculture between the years 1791 and 1796] will be found a reliable estimate of the condition of the agriculture of Scotland in the closing decade of the last century. Full accounts of the different shows are to be found in Mr Ramsay's carefully-prepared volume.

ABERDEEN FREE PRESS.—Mr Ramsay has recorded the achievements of the Society with a completeness that leaves nothing to be desired, and what in other hands might have turned out a dull and heavy volume, has by him been rendered a very useful and entertaining book, which will often be consulted with pleasure.

PERTHSHIRE ADVERTISER. —Having conceived his idea of what the history of the Highland Society should be as something outside the Society—the progress of agriculture in Scotland—Mr Ramsay has grouped around it all that relates to the Society with a method, a system, and a picturesqueness of detail that make the book one of the most readable on agriculture that we know of.

PERTHSHIRE CONSTITUTIONAL. Mr Ramsay has succeeded in making the history so authentic, valuable, and interesting that the library of no one having the slightest interest in agriculture will be complete without a copy.

INVERNESS COURIER. —An admirable record of the history and work of a patriotic association to which our country will be indebted in all time. It is a satisfaction to know that the story has been so well told, and will remain a permanent monument to its usefulness.

ELGIN COURANT. —The History of the Highland and Agricultural Society is really the history of the progress of agriculture in Scotland during the last century, and Mr Ramsay's pages throw much light on the extent and rate of that progress which the Society has done so much to encourage.

MORAY NEWS. —The impulse the Society communicated to agricultural improvement is admirably delineated in Mr Ramsay's pages. The systematic manner in which he has arranged the various heads and branches of his narrative, presents one stage of improvement after another in their natural sequence as to both time and place, forming a full and faithful panorama of the progressive state of Scottish agriculture during the past hundred years.

NORTHERN ENSIGN. Had Mr Ramsay indulged in mere generalities, or attempted in any way to epitomise so vast a subject, he would certainly have detracted from the value of his work. As it is, he very prudently adopted the safe course, and in an exact and comprehensive form, he has given us a book which, if read honestly, instead of superficially, will give an amount of information in connection with the doings of the Society and the benefits flowing from it, out of all proportion to what we could possibly obtain from any summary, however definitely its leading propositions might be set forth.

NEWCASTLE DAILY JOURNAL.—Mr Ramsay has evolved out of a pile of somewhat musty records and old volumes a clear narrative, which must be of interest, not only to the farmer, but to the general reader, and be regarded as a most useful and valuable piece of authentic history. While the work omits nothing of importance as to the Society's proceedings, and contains besides much that will be found valuable for reference, Mr Ramsay has been careful not to overburden his volume with dispensable details.

GLOUCESTER STANDARD.—In order to secure the accuracy of a bulky book like this, which contains sixty-seven chapters, much labour and painstaking were needed, and they have been so ungrudgingly bestowed that the volume must prove invaluable as a book of reference to landowners, farmers, and breeders of stock. Though the greater part of the book, giving an account of the Society's shows from their first start in 1822, may be considered as chiefly interesting to agriculturists, yet there are also chapters replete with information for the general reader.

YORKSHIRE POST.—A very interesting volume. No one can fail to learn something that must be of service to him in the present times, when difficulties seem to surround our agriculture on every side.

ALBANY CULTIVATOR (New York).—Mr Ramsay's task has been well performed; the general design of the book is quite comprehensive, its arrangement systematic, and its narrative sufficiently ample without undue details. The period embraced has witnessed a wonderful development in the agriculture of Scotland. The extension of sheep husbandry, the gradual spread of Shorthorn cattle, the development of the best Scotch breeds, and the extinction of others, the improvement in horses and sheep, and the better tillage by which this long interval is marked, and to the furtherance of which the Society's chief efforts have been directed, are illustrated at every step.

CONTENTS.

PAGE

1. On the Agriculture of the County of Sutherland. By James Macdonald, ... 1
2. Experiments with Soluble and Insoluble Phosphates and Nitrogen on the Growth of Turnips. By Thomas Lawson, 90
3. Improvements on the Estate of Denbrae, Fifeshire. By David Watson Wemyss, ... 103
4. On the Cheviot Breed of Sheep. By David Archibald, . 110
5. On the Old and Remarkable Ash Trees in Scotland. By Robert Hutchison, ... 129
6. On the Old and Remarkable Sycamores in Scotland. By Robert Hutchison, ... 150
7. On the Abies Albertiana, and its Value for Planting in Scotland. By Robert Hutchison, ... 172
8. On the Effects of the Severe Frost and Winter of 1878–79 on Trees and Shrubs. By Robert Hutchison, . . 180
9. On the Reclamation of Land from Moss on the Farm of Upper Bandeath, Stirlingshire. By John Mackie, . . 189
10. On Plantations on the Estate of Glengloy, Inverness-shire. By George Grant Mackay, ... 193
11. On the Different Methods of Making and Curing Butter in this Country and Abroad. By John M'Culloch, . . 196
12. On the Replanting of Woodlands. By Thomas Wilkie, . 221
13. On Providing a Sufficient Supply of Labour during Press of Agricultural Work. By John M'Culloch, . . 229
14. A Visit to Rothamsted. By Dr Andrew P. Aitken, . . 238
15. The Agricultural Experiments at Woburn. By Dr Andrew P. Aitken, ... 259
16. Account of the Show of the Highland and Agricultural Society held at Perth in 1879, ... 263
17. Experimental Stations—Report for 1879. By Dr Andrew P. Aitken—
    - Experiments at Harelaw and Pumpherston, . . . 271
    - Duplicate Experiments at Yester Mains, ... 295
    - Experiments on the Growth of Barley grown in pots under glass, 296
18. Instructions for Selecting Samples for Analysis, . . 302
19. The Cereal and other Crops of Scotland for 1879, and Meteorology of the Year relative thereto—
    - The Crops, ... 304
    - Meteorology, ... 317
20. Agricultural Statistics—
    - Table No. 1. Total Acreage under each kind of Crop in each County of Scotland, ... 323

PAGE

Table No. 2. Number of Horses, Cattle, Sheep, and Pigs in each County of Scotland, ... 324

Table No. 3. Quantities and Values of the Imports of Live Cattle, Sheep, and Swine, 1874 to 1878, . . . 325

Table No. 4. Quantities and Values of the Imports of Beef and Pork (salted), Bacon, and Hams, 1874 to 1878, . . 325

Table No. 5. Quantities and Values of the Imports of Wheat and Wheat Flour, 1874 to 1878, ... 326

Table No. 6. Quantities and Values of the Imports of Barley, Oats, Rye, Meal, and Malt, 1874 to 1878, . . . 326

Table No. 7. Average Prices of various kinds of Animals, Dead Meat, and Provisions, 1874 to 1878, ... 327

Table No. 8. Average Prices (per imperial quarter) of Home-grown Wheat, Barley, and Oats, in the Weekly Market of Edinburgh, for the Years 1875 to 1879, . . . 328

APPENDIX (A).

PROCEEDINGS OF THE HIGHLAND AND AGRICULTURAL SOCIETY—

Proceedings at Board Meetings, February 1879 to January 1880, ... 1

Proceedings at General Meeting, 18th June 1879, . . 17

Proceedings at General Meeting at Perth, 30th July 1879, . 24

Proceedings at General Meeting, 21st January 1880, . 29

Report of the Society's Veterinary Examinations, Session 1878–79, ... 43

Premiums awarded by the Society in 1879–80—

1. Reports, 1879–80, ... 45
2. Dumfries Show, 1878, ... 45
3. Perth Show, 1879, ... 46
4. District Competitions, ... 63
5. Cottages and Gardens, ... 74
6. Veterinary Department, Medals to Students, . 77
7. Agricultural Chair, Edinburgh University, Prizes to Class, ... 77

State of the Funds of the Society at 30th November 1879, ... 79

Abstract of the Accounts of the Society for 1878–79, . 80

Abstract of the Accounts of the Perth Show, 1879, . . 82

Abstract of the Accounts of the Argyll Naval Fund for 1878–79, ... 84

APPENDIX (B).

PREMIUMS OFFERED BY THE HIGHLAND AND AGRICULTURAL SOCIETY IN 1880—

General Notice, ... 3

Constitution and Management, ... 4

Establishment, ... 5

Committees, ... 7

Agricultural Education, ... 10

PAGE
Veterinary Department, . . . 13
Forestry Department, . . . 19
Chemical Department, . . . 20
General Regulations for Competitors, . . 21
Class I., Reports—
1. The Science and Practice of Agriculture. . . 22
2. Estate Improvements, . . . 27
3. Machinery, . . . 29
4. Forestry Department, . . . 29
Class II., District Competitions, . . 33
Class III., Cottages and Gardens, . . 46
General Show at Kelso in 1880, . . 51
General Show at Stirling in 1881, . . . 70
List of Members admitted since January 1879, . . 74

TRANSACTIONS

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

ON THE AGRICULTURE OF THE COUNTY OF SUTHERLAND.

By James Macdonald, Aberdeen.

[*Premium—Thirty Sovereigns.*]

Excepting Caithness, Sutherland is the most northern county in the mainland of Scotland. It is situated between 57° 53′ and 58° 33′ N. latitude, and between 3° 40′ and 5° 13′ W. longitude from London. It is separated from Caithness on the east by a winding range of hills, and from Ross-shire on the south and south-west by the Dornoch Firth and the river Oikel, and some smaller streams. On the south-east it is washed for a distance of about 32 miles by the Moray Firth; on the west, for over 40 miles by the Minch, an arm of the Atlantic Ocean; and on the north, for about 50 miles by the waters of the Northern Sea. In form the county thus presents five sides, the longest, about 52 miles, being the south and south-west side, and the shortest, about 32 miles, that on the south-east. The extent is variously estimated—in the Return of Owners of Lands and Heritages, at 1,299,253 acres; and the Board of Trade Returns at 1,207,188 acres, or the seventeenth part of the whole surface of Scotland.

From the Parliamentary Return of Owners of Lands and Heritages in Scotland, compiled in 1872–3, it is seen that in Sutherland there are 433 owners of land, the total area of whose property is estimated at 1,299,253 acres, and the gross annual value at £71,494, 7s. Though, according to this estimate of its size, it is exceeded in extent by only four counties in Scotland, Sutherland has the smallest number of proprietors, with the

exception of the small divided county of Cromarty. It stands thirtieth in regard to gross annual value. Of owners of land whose property extends to or exceeds 1 acre, it claims 85, while of owners of 100 acres and upwards (excluding railway proprietors) it has only 23, the total area of whose property is estimated at 1,297,301, and the gross annual value at £65,949, 7s. Eleven proprietors exceed 1000 acres in extent; the gross annual value of six exceeds £500; while only three Sutherland owners draw over £1000 a-year from land in the county. These latter three are :—

	Estimated Acreage.	Gross Annual Value.
The Duke of Sutherland, . . .	1,176,343	£56,395 13 0
E. C. Sutherland-Walker, Esq. of Skibo, .	20,000	3,231 14 0
Sir James Matheson of the Lews and Achany,	18,490	1,812 10 0
Totals, . .	1,204,833	£61,439 17 0
Other 430 landowners, . . .	94,420	10,054 10 0
	1,299,253	£71,494 7 0

It will thus be seen that while it is not absolutely correct to say that the Duke of Sutherland owns the whole of the county whose name he bears, His Grace's dominions in the far north have wide limits. He in fact not only owns by several times the largest landed property in the United Kingdom, but possesses more than nine-tenths of the fifth largest county in Scotland.

The Valuation Roll for 1878–79 shows that the gross annual value of the county, exclusive of railways and the royal burgh of Dornoch, was £87,795, 3s. 2d.; that the annual value of railways amounts to £7144; and that the annual value of the burgh of Dornoch is £874, 10s.; making in all, £95,813, 13s. 2d. The Board of Trade Returns for the present year (1879) state the area under all kinds of crops, bare fallow and grass, at 29,441 acres;—wheat, 27; barley or bere, 2268; oats, 7809; rye, 87; peas, 44;—total under cereals, 10,235 acres. The acreage under green crops was—potatoes, 1929 acres; turnips, 3232; mangold, 1; rape, 19; vetches or other green crops, 46;—total of green crops, 5227 acres. The area under grasses in rotation is 7617 acres, and of permanent pasture, exclusive of heath or mountain land, 6102. Of bare fallow there were 260 acres.

The Norse Teutons who, prior to the twelfth century, had settled in Caithness, and frequently plundered farther south, gave the name of Sutherland to this county, from the fact that it formed the southern limit of their possessions. Indeed, it is barely a century ago since it was separated from the sheriffdom of Caithness and formed into a sheriffdom by itself. It contains thirteen parishes, and, in addition, part of the parish of Reay

extends across the Caithness boundary into this county. It sends one representative to Parliament, the sitting member being the Marquis of Stafford; while the royal burgh of Dornoch joins with Dingwall, Tain, Cromarty, Wick, and Kirkwall in electing another. Mr John Pender at present occupies this latter seat.

Dornoch is the only royal burgh in the county. It was created so by Charles I. in 1628, and is mentioned frequently in ancient northern history. The circumstance which, according to tradition, gave to Dornoch the name it now bears is so peculiar as to deserve notice. Dornoch is derived from the Gaelic words *Dorn-Eich*, which signify a horse's foot or hoof; and a writer in the "Old Statistical Account of Scotland" says—"About the year 1259, the Danes and Norwegians having made a descent on this coast were attacked by William, Thane or Earl of Sutherland, a quarter of a mile to the eastward of this town. Here the Danish general was slain, and his army beaten, and forced to retire to their ships, which were not far distant. The Earl of Sutherland greatly signalised himself upon this occasion; and appears, by his personal valour and exertion, to have contributed very much to determine the fate of the day. While he singled out the Danish general, and gallantly fought his way onwards, the Thane, being by some accident disarmed, seized the leg of a horse, which lay on the ground, and with that despatched his adversary. In honour of this exploit, and of the weapon with which it was achieved, this place received the name of Dorneich, or Dornoch, as it is now called. This tradition is countenanced by the horse-shoe, which is still retained in the arms of the burgh." Dornoch boasts of a beautiful cathedral which, according to Sir Robert Gordon's "History of Sutherland" (1630-32), was founded by St Bar, Bishop of Caithness, in the eleventh century. Gilbert Murray, consecrated Bishop in 1222, transformed the original church into a magnificent cathedral, which unfortunately was reduced to ruins by fire in 1570 by John Sinclair, Master of Caithness, and Iye Mackay of Strathnaver, who, taking advantage of the minority of Alexander, Earl of Sutherland, besieged and plundered Dornoch with a small army from Caithness. Fortunately the old tower was saved, and so also were some fine Gothic arches, but the handsome stone pillars that supported the latter were destroyed by a terrific gale of wind on the 5th November 1605,—the day, by the way, on which the Gunpowder Plot was discovered. The Earl of Sutherland partially repaired the cathedral in 1614, so as to make it suitable as a place of worship, and in 1863 the late Duchess-Countess of Sutherland re-erected the edifice, and embellished it with even more than its former grandeur. The Sutherland family have a burying place within the cathedral, and in the east aisle are a beautiful marble statue

of the first Duke of Sutherland, by Chantrey, and a tablet to commemorate the many virtues of the Duchess-Countess of Sutherland, both of whose remains lie in that aisle. Sir Robert Gordon states that all the glass required for the church erected by St Bar was made by St Gilbert, at Sidry, two miles west from the town of Dornoch; and that adjoining this church Sir Patrick Murray, between the years 1270 and 1280, established a monastery of Trinity Friars. Since the commencement of the present century the town of Dornoch, like the whole of the county, has been vastly improved. Little more than fifty years ago there were a good many *feal* or turf houses in the burgh, and now the buildings are as a rule neat and commodious, built of stone and lime and slated. Several of the more important buildings indeed are very handsome, and would do credit to a much larger town. Situated as Dornoch is in an out-of-the-way angle of the county, its trade is limited, and in 1871 its population was only 625. The scenery around Dornoch is very beautiful, and regarding its links Sir John Sinclair says—"About the town along the sea-coast there are the fairest and largest links, or green fields, in any parts of Scotland, fit for archery, golfing, and all other exercise. They do surpass the fields of Montrose and St Andrews." The thriving modern village of Clashmore lies about three miles north of Dornoch, and near to it stands Skibo Castle, the handsome residence of Mr Evan Charles Sutherland-Walker of Skibo. A castle with garrison, under the charge of a general officer, formerly stood for centuries on the site of this mansion, and history and tradition tell us that around it many a bloody conflict took place. In 1650 the brave but ill-fated Marquis of Montrose, after his defeat by the Presbyterian army near Bonar Bridge, and capture and betrayal by Neil Macleod of Assynt, lodged two nights as a prisoner in Skibo Castle.

Twelve and a half miles along the coast northwards lies the beautifully situated prosperous village of Golspie, with a population (1871) of 1074. As in Dornoch, the majority of the dwelling-houses in Golspie were, at the beginning of the present century, of the most primitive description, and the inhabitants were chiefly fisher people. Now, however, its houses are all substantial and comfortable, many of them very large and handsome. It is entitled to be ranked as the most prosperous village in the county. A convenient pier, accessible at low water, constructed by the Duke of Sutherland at Little Ferry, about three and a half miles distant from the village, has proved a great acquisition. Both by road and rail Golspie is also well-appointed.

Dunrobin Castle, the chief seat of the Sutherland family, and, without doubt, the most magnificent of all the many mansions in Scotland, sits majestically on a beautiful spot on the sea-coast about a mile north of Golspie. Part of the castle is said to be

the oldest inhabited house in Britain, but a great portion is of modern construction, having been erected between 1845 and 1851 by the second Duke and Duchess. The style of architecture is chaste and elegant, while the interior is, if possible, still more grand, the paintings and other works of art being numerous and of great value. The policies are extensive and beautiful; and the gardens lying between the castle and the sea, "remarkable alike for their extent, beauty, and productions." From the higher windows of the castle the view is extensive, varied, and picturesque. Overlooking the castle stands the romantic Ben-Bhraggie, on the top of which there is a monument 70 feet high, surmounted by a colossal statue 30 feet high, of the first Duke of Sutherland, who died in 1834. This monument, erected by Her Grace's tenantry and friends, is said to have a higher site (1300 feet) than any other monument in the kingdom. Nearer there are handsome monuments of the second Duke and Duchess and other members of the noble family of Sutherland, all of whom have served well their day and generation.

At Brora, in the parish of Clyne, there is a prosperous growing village, fostered mainly by improvements and various works carried on by the Duke of Sutherland. The village of Helmsdale, situated at the mouth of the river of that name, has a larger population, chiefly dependent on the herring fishing. There are numerous other small villages throughout the county, that of Tongue on the west coast being snugly situated amidst the most charming of Highland scenery.

The general configuration of Sutherland is wild and mountainous in the extreme. Along the south-east coast there is a flat fertile border, varying from little more than half a mile to over two miles and a half in breadth, laid off in well-appointed farms, and yielding profitable crops. The coast on the west and north, on the contrary, is bare, bold, and precipitous, abounding in rocky promontories and numerous inlets of the sea; while "the whole of the interior," says one writer, "is mountainous, varied with elevated plateaus covered with heath, vast fields of peat bog, some pleasant straths of average fertility, watered by considerable streams and numerous lakes, embosomed either in bleak dismal regions of moorland, or begirt by a series of hills of conglomerate, whose naked and rugged sides have no covering even of heather. Wildness and sterility are the great features of the landscape, the dreary monotony being seldom relieved by tree or shrub; and this uniformity of desolation is only occasionally broken by some glen or strath presenting itself as an oasis of verdure in the bleak desert." This picture, rough though it be, is in the main correct; but it barely does justice to the straths, some of which, considering their high northern latitude, are of more than average fertility, while a few of the lakes are

girt by beautiful fringes of natural wood, which have a wonderful softening effect on the general sterility around.

Ben-More-Assynt reaches a height of 3235 feet; Ben-Clibrig, 3157 feet; and Ben-Hope, 3040 feet; while Ben-Laoghal (Loyal), Ben-Horn, Ben-Bhraggie, and others follow, at lower elevations. Ben-Loyal, viewed from the west or the north-west, is considered one of the most beautiful mountains in the British Isles, and has engaged the brush of not a few noted artists.

There are "literally hundreds" of lochs in the county, and in all they are estimated to cover close on 34,000 acres. The larger are—Loch Shin, 16 miles long and about 1 mile broad; Loch Assynt, 8 miles long and 1 mile broad; Loch Naver, Loch Hope, Loch Loyal, and Loch More. Naturally, from the narrow limits of the northern peninsula, of which this county forms the southern portion, the river courses are short, but some of them —those that flow through lakes—discharge more water than many rivers that run over twice as great a distance. The four larger rivers—viz., the Oikel, Fleet, Brora, and Helmsdale rivers —flow eastward into the Dornoch and Moray Firth sections of the German Ocean. The Oikel, flowing out of Loch Ailsh, and receiving its tributary, the Shin, at Invershin, is an excellent salmon and trout river, and forms the boundary line between Ross and Sutherland for close on 30 miles. The Fleet is formed by some small streams in the parish of Rogart, and after a short run expands into Loch Fleet, which joins the firth at Little Ferry, a few miles south of Golspie. Brora has its source in the parish of Lairg, and, including the loch, it is about 24 miles in length, or about 4 miles more than the course of the Helmsdale river. The principal rivers on the west coast are the Halladale, which rises in the heights of Kildonan, and, after threading through a beautiful strath close on 20 miles in length, empties itself into the North Sea at Melvich; the Naver, which has its source in Loch Naver, which is about 24 miles in length, draining the most beautiful and valuable strath in the county; the Dionard, Kirkaig, and Inver. The smaller streams are innumerable.

So high an authority as Mr J. Watson-Lyall asserts that Sutherland is, "without exception, the best angling county in Scotland—especially for trout. . . . . Many of the lochs of Sutherland are splendid sheets of water, and many are nameless mountain tarns; but even those least inviting in appearance hold lots of trout. No one who wants really good trout-fishing should hesitate to penetrate into Sutherland." The greater number of the lochs and streams can be fished for trout by strangers who are guests at the hotels on the Duke of Sutherland's property. On many of the lochs and rivers there is also good salmon-fishing, but in most cases it is let to shooting or

other tenants. The Duke of Sutherland has for several years carried on at Brora, under the management of Mr Dunbar of Brawl Castle, extensive experiments on the breeding of salmon; and, by introducing into the streams of Sutherland the salmon of such rivers as the Tweed, the Tay, and the Thurso, he has very greatly increased the value of the salmon fishing on his property. To those who prefer the gun to the rod there is also strong attraction in Sutherland. It contains many excellent grouse moors and a few good deer forests. The largest of the latter is Reay Forest, rented by the Duke of Westminster at £1290.

Sutherland stands twenty-third in Scotland in regard to the area under wood. In 1853 that area was estimated at 10,812¾ acres, but according to a Board of Trade Return in 1872 it was then only 7296 acres. The natural clumps of shrubbery along the straths in the interior have been gradually disappearing, and it may be that a greater area of these was included in the estimate of 1853 than in that of 1872. About the beginning of the present century, the extent under plantations of fir and hard wood was estimated at about 936 acres, and under natural wood or shrubbery, in the straths of the several rivers and rivulets, at 1350—making in all, 2286 acres. Between 1836 and 1842, new plantations, extending to 2091 acres, were formed under the direction of Mr James Loch, commissioner to the Duke of Sutherland, at a total cost of £2344; and an interesting report on the improvement will be found in vol. i. 3d series, of the "Transactions of the Highland and Agricultural Society," p. 36. Since 1872 the area under wood has been considerably increased by new plantations formed in connection with the land reclamations. These plantations will be referred to hereafter.

When it is mentioned that, according to a liberal estimate, barely one-twenty-fifth part of the county is capable of being cultivated, it will easily be understood that Sutherland does not occupy a prominent position from a strictly agricultural point of view. In regard to the total area under crops, bare fallow, and grass, it stands twenty-ninth among the Scotch counties—Nairn, Bute, Selkirk, and Clackmannan ranking below it. Nairn has a slightly greater area under regular cultivation, but, on the other hand, Shetland has a less area under rotation, so that, likewise from that point of view, Sutherland is still left twenty-ninth in order. In reference to the proportion or percentage of the total area of the county occupied by "crops, bare fallow, and grass," it is lowest on the list. Another illustration of the mountainous and sterile character of the main portion of Sutherland is supplied by the fact that the total valuation of the county, as returned in the Valuation Roll for 1878–79

(including railways and the royal burgh of Dornoch), is equal to only about 1s. 7d. per acre—the lowest by far of any of the Scotch counties. Limited, however, as is its arable area, Sutherland has, in regard to the system of management pursued on most of its farms, pushed itself, with commendable spirit, fully abreast of the times. Indeed, on the larger and better arable farms of Sutherland, the modern and improved systems of farming are carried out with as much success and perfection as in the Lothians, or in any of the other better favoured regions of Scotland. The wealth and reputation, however, of Sutherland lies chiefly in its sheep farming, for which its long-winding straths and wide mountain ranges are admirably adapted; and which is carried on, not only on a very extensive scale, but also in a most advanced, systematic, and successful manner.

As shall be afterwards shown, Sutherland was the last county in Scotland to be opened up, as it were, to free intercourse with the outer world. Indeed, up to the commencement of the present century, it may be said to have been locked up by water and mountain. But now, both internally and with the world beyond, it enjoys ample means of communication. By the liberality and enterprise of the Duke of Sutherland, the Highland Railway was extended to Golspie in 1868, and to Helmsdale three years later; while in 1874 the same line was continued to Wick and Thurso. The active laudable interest His Grace has taken in the conferring of the inestimable boon of a railway system on the Highlands of Scotland is well testified by his contributions towards that object, which are stated at £301,000. The line from Bonar Bridge to Golspie cost him £116,000, and from Golspie to Helmsdale, £60,000, while he contributed other £60,000 towards the extension of the system to Caithness. It is worthy of mention, that in the formation of the line from Golspie to Helmsdale, the Duke acted as his own contractor, the work having been carried out under his own personal supervision.

Population.

The following table shows the population at various periods since the close of last century:—

1798	22,361	
1801	23,117	
1811	23,629	
1821	23,840	
1831	25,518	
1841	24,782	
1851	25,793	
1861	25,246	
1871	24,317	
Increase since 1801		1,254
Decrease since 1851		1,476

It is not the writer's intention to discuss what are known as the "Sutherland clearances." Fitly termed a "vexed question," it is outside the legitimate scope of this report, inasmuch as the operations so named occurred about sixty years ago. It may just be explained, in a word, what these clearances really were. Previous to 1811, the various straths that intersect the county were peopled more or less densely by a class of small tenants, who were dependent for their sustenance mainly on potatoes and inferior and ill-fed cattle and sheep. Through severe winters, which sadly thinned the ranks of their cattle and sheep, these tenants and their families were frequently reduced to absolute dependence on their landlords and other superiors for food sufficient to sustain life. It was thought desirable that some change should be made in the condition of the people, both for their own interests and with the view of properly developing the resources of the county. The subject was remitted by Lord Stafford, the first Duke of Sutherland, to eminent agriculturists, who reported in effect "that the mountainous parts of the estate, and indeed of the county of Sutherland, were as much calculated for the maintenance of stock as they were unfit for the habitation of man;" and that it seemed "as if it had been pointed out by nature that the system for this remote district, in order that it might bear its suitable importance in contributing its share to the general stock of the country, was to convert the mountainous districts into sheep-walks, and to remove the inhabitants to the coast, or to the valleys near the sea." The movements thus indicated were carried into effect about the time already mentioned,—between 1810 and 1820,—the great bulk of the small tenants and their families having been settled near the coast, where a limited piece of land was allotted to each at a merely nominal rent. It is stated also that a few, who preferred that step, were conveyed to Canada at Lord Stafford's expense; but it is denied that the population of the county was reduced to any appreciable extent by emigration due to these "clearances." As to what extent the removing of these small tenants from the interior to the coast has affected the population of Sutherland, I shall not hazard an opinion; but it may be observed, in treating of this portion of the subject, that the manner in which the county is mainly occupied, as sheep-walks and deer forests—chiefly the former—naturally implies a "maximum of territory, with a minimum of industry and population." Captain John Henderson, in his admirable work on the "Agriculture of Sutherland," published in 1812, calls the county "a nursery of brave, hardy Highlanders," but they have now become scarce; and in bringing about the change there have no doubt been more agencies at work than emigration and the introduction and extension of sheep-farming,—

such, for instance, as the abolition of private or "family" regiments, and the high rate of wages in the south.

The inhabited houses in 1871 numbered 4814, so that there is rather more than an average of five persons to each house. Of the population in 1871 there were 11,408 males and 12,909 females. The present population is equal to about one person for every 50 acres, the proportion of land to each person in Ross and Cromarty being exactly one-half of that extent. What may be termed the natives of Sutherland, the descendants of the "ancient inhabitants," like those of Ross and Cromarty, belong to one or other of the branches of the Celtic race, and have pursued similar habits in social life. Sutherland, too, has had a full share with its neighbours in regard to invasion and plunder, the fierce Norsemen and the Danes having made frequent raids on the county, leaving behind them indisputable traces of their presence, as well as of the character of their mission. In the parish of Golspie there are the ruins of three "Pictish Towers," built and used, it is supposed, by the Danes. One of the three is situated near Dunrobin Castle, and is in a wonderfully good state of preservation. The north and west coast abounds with these ruins. One in Strathmore, in the parish of Durness—"Donnadillee"—is the most perfect in the county, the walls still standing to a height of 20 or 30 feet above ground. Interesting, however, as they are, space cannot be devoted to these points. Gaelic is still the "every-day" language of the older or *bona fide* natives of Sutherland, not a few of whom understand very little English, and can speak still less, or even none at all. But, under the bracing current of national education, and the ever-increasing intercourse between the inhabitants of the Highlands and other parts of the country, the Celtic language is fast dying out, and perhaps, except from a philological point of view, is doomed to extinction at no distant date. Since the commencement of the present century, more particularly during the past twenty-five years, a large number of farmers and others from the south and north-east of Scotland have settled in Sutherland, and these fresh infusions have materially modified the habits of the people, as well as tended to hasten the demise of Gaelic. The dwelling-houses of the smaller tenants have been greatly improved during the past quarter of the century, chiefly by the proprietors; and there are now comparatively few of those low, black, uncomfortable "feal" houses that were to be seen everywhere throughout the county, even in villages and the royal burgh of Dornoch, at the commencement of the present century. These small tenants hold their lots of land at low rents, are as a rule sober and of good moral character, and are more industrious, better educated, better fed, and better clothed, as

well as better housed, than when they were scattered along the straths in the interior. Sutherland was long ill-provided with educational machinery. About the commencement of the present century it is stated that it had a Gaelic teacher in each parish, paid at the rate of from £15 to £27 a-year, and that the number of scholars was about 1012, or in the proportion of about 1 to every 21 of the population. The Education (Scotland) Act, 1872, however, has supplied all wants in this direction; and, though the school rates are high at present, great advantages must flow from the superior education now being diffused throughout the county. With parishes of so large an area and so thinly spread a population, it has been found to be no easy matter to carry out the Education Act properly in Sutherland, but the School Boards of the county have displayed much care and ability, and have, as a rule, done their work well. One difficulty was to know how to extend the benefits of the Act to the families of shepherds who reside away among the mountain ranges, perhaps 12 or 20 miles from the nearest school. This is now being satisfactorily accomplished by female teachers, who "go the round" of these outlying houses teaching a week or a fortnight in one family, and a like period in another.

Climate.

The climate varies considerably in different districts of the county. On the east coast, that is to say, on the narrow irregular stretch of country that lies between the mountain range and the German Ocean, the climate is dry and mild. Captain Henderson says, "Though the east coast of Sutherland is 3° farther north than East Lothian, there is much less difference between the two in regard to climate than could well be imagined. The spring may be two weeks later, and the winter may commence two weeks earlier, but the summers are equally warm, if not warmer, and the winters not colder." Snow seldom lies long on the ground in this part of the country, and the rainfall cannot be said to be heavy, about 31 inches, or little over the average for Easter Ross. The prevailing winds blow from the west and north-west, but the moisture they absorb in their long course over the Atlantic Ocean is mostly deposited among the broad range of hills and dales which are passed before the east coast is reached. These winds, indeed, bring only occasional showers over upon the east coast. The easterly winds, next in frequency, as a rule bring rain and cloudy weather, sometimes very heavy falls of rain; but these gales and rainfalls are usually succeeded by a period of mild dry weather. The southerly winds, which are not frequent, are seldom accompanied by rain. The land in some parts of the east coast, in a good season, is ready for the seed

by about the middle of March, when several farmers commence sowing; and on the earlier farms harvest commences about the middle of August, being general all along the east coast by the middle of September. Among the hills in the interior of the county the climate, as would be expected, is cold, boisterous, and wet, the winters being long and severe, and the springs late and cold. Though a good deal of snow falls during winter, it does not, as a rule, lie long to a great depth on the ground. Last winter snow lay in the greater portion of the county to a depth of nearly 2 feet for about four months, but it was one of the most severe winters that have ever been experienced in the Highlands of Scotland, and, excepting along the west coast, showed little partiality in its visitation. In the straths which intersect the county the climate is wonderfully mild. The valley of Kildonan, inland and mountainous though that district is, is almost as mild and genial as along the east coast; and, on the few irregular fields by the river side, oats are usually ready for the sickle at least two weeks earlier than on an average farm in the counties of Aberdeen and Banff. Frosts, however, visit the straths early in the autumn, while, especially in those towards the west coast, a great deal of rain falls. In the Assynt district the climate is moist, the annual rainfall being about 60 inches. Owing to the sea breeze and the influence of the Gulf Stream, snow does not lie long excepting on the more elevated parts. Towards Durness the temperature becomes colder, more particularly northwards from Cape Wrath, where the influence of the Gulf Stream is less felt than south of that bold promontory. Around Tongue the climate is surprisingly dry and mild, the rainfall being only about 36 inches, and the mean temperature 45°. Snow seldom lies long near the coast, and the winter, as a rule, is comparatively mild and open, spring being generally more severe than winter owing to the prevalence of cold northerly, north-easterly, and easterly winds, which often seriously retard vegetation. In favourable seasons the grain is usually harvested by the middle of September. On the higher lands near the west coast a great deal of rain falls; but a heavy covering of snow seldom continues long.

The climate of Sutherland is generally regarded as very healthy for both animal and vegetable life; indeed, Captain Henderson states that "it is so healthy that one medical man is all that can earn a livelihood from his profession in the county;" while it has been said that, even as late as about 1840, apothecaries' drugs were almost never called for. But now Sutherland has a larger share of both than in these more primitive times. As already stated, the annual rainfall at Scourie, in the Assynt district, on the west coast, is about 60 inches, and at Tongue, on the northern coast, about 36 inches. The following table shows

the amount of the rainfall at the Dunrobin Castle Gardens in each of the past ten years :—

Years.	Rainfall in inches.	Years.	Rainfall in inches.
1869	28·55	1874	30·76
1870	26·75	1875	27·38
1871	23·93	1876	34·62
1872	34·98	1877	41·65
1873	34·20	1878	34·36

Average for ten years, 31·71 inches.

The following is a statement of the rainfall in the first nine months of the present year (1879) :—

	Rainfall in inches.	Number of days on which ·01 or more fell.
January,	1·51	12
February,	1·15	12
March,	2·22	15
April,	1·92	12
May,	2·63	20
June,	2·95	17
July,	5·13	17
August,	3·47	19
September,	1·56	14
Totals,	22·54	138

The following indicates the number of days in each of the past four years in which ·01 or more rain fell :—

1875	157 days
1876	209 „
1877	244 „
1878	180 „

Geology.—Soils.

The relations between underlying strata and surface soils are generally so intimate that, as a rule, a report on the agriculture of a county or district would be incomplete without some sketch of the geological formation; but, in this case, there are circumstances which make it undesirable to occupy space with such an account. In the first place, the subject has already been ably dealt with in the "Transactions of the Highland and Agricultural Society" by Mr R. J. Hay Cunningham, M.W.S., whose admirable "Geognostical Account of the County of Sutherland" appears in vol. vii., 2d series, p. 73. Again, the exceptionally small portion of the soil of the county that is worked for agricultural purposes makes a lengthy sketch of its geology less desirable than it otherwise would be. A few sentences will therefore suffice. Generally speaking, it may be said that the underlying strata of the county belong to

the Primitive and Transition systems, the Primary rocks consisting chiefly of coarse granite, gneiss, syenitic gneiss, and mica-schist. Sir Humphrey Davy examined the east coast of the county, and from his manuscript report, which is treasured in Dunrobin Castle, lengthy extracts are given in the "New Statistical Account of Scotland." He states that the Primary hills in the neighbourhood of Dunrobin are composed of felspar, quartz, mica, and horneblende; that the only veins he had seen in the rocks were quartz, in which there were no indications of metallic foundations; and that the highest Secondary hills in that district, extending in a line from Loch Brora to Strathfleet, are composed of hard silicious sandstone and pudding stone, containing large fragments of the Primary rocks. The Transition rocks of Sutherland, he says, are not numerous nor wide-spread; but some of the hills in the immediate neighbourhood of Dunrobin and Strathfleet, Ben Bhraggie, Ben Horn, and the Silver Hill, for instance, are composed of red transition and breccia, the sandstone being in some parts white, in some grey, and in others iron-brown. The Secondary rocks, which he says are more interesting, occupy but a small space, and are probably incumbent on the red sandstone and breccia referred to. "The true Secondary strata of the east coast of the county occupy an extent of 6 or 7 miles, filling up a sort of basin between the Transition hills in the neighbourhood of Dunrobin and those in the parish of Loth. The upper stratum is a sandstone of different degrees of hardness and composed of silicious sand cemented by silicious matter. Below this occurs an aluminous shale containing pyritous matter, carbonaceous matter, the remains of marine animals, and of land vegetables. Beneath this shale, or rather alternating with it, a stratum occurs, containing in some of its parts calcareous matter and passing into limestone, but in general consisting of a silicious sand agglutinated by calcareous cement. The coal-measures occupy the lowest part of this Secondary district which has yet been exposed. The hard sandstone is principally composed of pure silicious earth. It is not acted upon by acids, and is not liable to be decomposed by the action of air and water. The shale contains no calcareous matter near its junction with the coal. The limestones found in the Secondary strata contain no magnesian earth, and are adulterated only with aluminous and silicious earths and oxide of iron. They differ very much in purity in different parts." Another writer says that gneiss composes at least four-fifths of the whole surface of the county, and that the Old Red Sandstone occurs in patches both on the north-west towards Cape Wrath, and on the south-east along the Dornoch Firth. In the last portion he says it is succeeded by one of the most remarkable geological formations in Scotland, the Brora coalfield, in connection with which there are strata

of lias and oolite found in no other part of Scotland, except a small patch on the west of the town of Campbeltown in Kintyre and a few patches in the Western Isles. On the north-west the rocky headlands consist of the Laurentian gneiss, while above it "lie isolated mountains of Cambrian sandstone." There are also strata of the Lower Silurian system, the limestones of which are wrought for estate improvements, by the Duke of Sutherland, at Eriboll, on the west coast, and at Shiness, on Loch Shin, in the interior.

As already stated, the arable land in the county is confined mainly to a narrow fringe along the south-east coast. Here the most general soil is a light sandy loam that yields liberally under generous treatment. Between Bonar Bridge and Dornoch the soil is light gravelly loam. In the parish of Dornoch it is clayey inland and sandy near the sea, with an irregular belt of black loam intervening. The soil on the arable land in the Golspie district varies from very light sand to medium clay, the most general and best being loam with a slight admixture of clay. Sir H. Davy says that the soils of the coast-side lands between Little Ferry, a few miles south of Golspie, and Helmsdale, seem to be formed principally from the decomposition of sandstone rock, which in some parts approaches in its nature to shale. The soils in Strathfleet appeared to him to have been produced by the decomposition of Transition sandstone and breccias. Around Brora the soil is light and gravelly, but in Loth there is some excellent heavy land; one hollow on the farm of Crakaig, in particular, being covered with deep bluish clay. "Prior to the sixteenth century," says Captain Henderson, "the river of Loth, as it emerged from the mountains, turned due north, running parallel to the sea, at the distance of about a quarter of a mile from it, through what is now called the Vale of Loth, and there formed a swamp or marsh, divided from the sea by sandy banks, until an enterprising Countess of Sutherland caused a course to be cut for the river to the sea, through a rocky eminence." By this means about 100 acres of excellent carse land were reclaimed, and being well drained, it yields good crops of wheat, barley, oats, turnips, and grass. Around Helmsdale the soil is light but fertile, while along the Helmsdale or Kildonan Strath there are several small haughs of similar soil, with rather less sand, that yield good crops of oats and turnips. The soil on the higher banks along this strath consists of reddish gritty sand and peat-earth, in which are embedded numerous detached pieces of granite rock or pudding stone. In Strathbrora and Strathfleet there are also several good small pieces of haugh land, some being of medium loam; while in the parishes of Rogart and Lairg there is a considerable extent of light gravelly loam, mixed with moss, and lying on a

clayey subsoil. Perhaps nine-tenths of the interior, however, is covered with peat-earth, and there are many broad swamps of deep moss. The surface of the Assynt district is so rough and rocky that, with the exception of a few spots consisting chiefly of moss, it contains no land suitable for cultivation. The same may almost be said of the parishes of Eddrachillis and Durness, although there are several good patches of mixed gravel and moss, and a few small pieces of fair loam. In Durness there are three farms—Balnakiel, Eriboll, Keoldale—with arable land attached—150 acres to each of the two former, and 100 acres to the latter. It is also a good grazing parish, the limestone which underlies its surface-soil proving a valuable stimulant to its pasture. The arable land in the parishes of Tongue, Farr, and Reay lies mostly along the coast, and the soil on a few spots is good black loam, on other parts sandy loam, but on the greater portion a varying mixture of moss, gravel, and clay, which yields good crops under liberal treatment. Along Strathnaver, the finest strath perhaps in the county, there is a considerable extent of good haugh land, a mixture of sand, gravel, and moss, which was for many years previous to 1820 cultivated by over 300 families. On the banks of the river Strathy there are some patches of thin fertile sandy land. In Strathhalladale there were at the beginning of the present century about 300 acres of light soil, similar to that in Strathnaver, cultivated in small holdings.

Condition of the County Seventy Years ago.

Sutherland was the last county in Scotland to throw off what may be called the thraldom of the dark ages. After the other counties in the Highlands had enjoyed improved communication with the world beyond, Sutherland still lay in a manner locked up by sea and mountain; while devoid as it was of what could be called roads, and consisting as it does almost entirely of "one uninterrupted succession of wild mountain or deep morass," the intercourse between the different districts within the county itself was "confined exclusively, or nearly so, to the exertions of those who could travel on foot, and even this mode of communication, except to the natives who were brought up to such toil and exertion, was almost impracticable," not to say dangerous, "in passing precipices or struggling through swamps." The proprietors and other leading inhabitants of Sutherland, however, early availed themselves of the Act passed by Parliament in 1803, giving aid in the construction of roads and bridges in the Highlands of Scotland;—they even took the lead of their brethren in Ross, Cromarty, and Inverness in the matter—and with commendable spirit set to work to open up the county. The two main obstructions were the Dornoch Firth and Loch

Fleet, but at last both were successfully overcome. Across the former, at Bonar, a very handsome bridge was constructed by Mr Telford at a cost of £13,971. It consists of two stone arches of 50 and 60 feet span respectively, and one iron arch of 150 feet span; while on the Ross-shire side an extensive embankment had to be made. The work was begun in July 1811 and completed in November 1812. Mr James Loch, commissioner on the Sutherland estates, in his interesting account of the Stafford improvements, published in 1820, states that the iron portion of this handsome bridge "was cast in Denbighshire, where it was first put together, and then taken to pieces and re-erected in the furthest extremity of the Highlands of Scotland, and exhibits in that remote district a striking monument of national enterprise and liberality, and of the public spirit of the county of Sutherland." The other arm of the sea referred to,—Loch Fleet, or the Little Ferry,—lies between Dornoch and Golspie. A mound, 999 yards long, 60 yards wide at the base, 18 feet in perpendicular height, and sloping to about 20 feet wide at the top, was formed at a narrow part of the channel, and at the north end was constructed a substantially built bridge, 34 yards long, consisting of four arches of 12 feet span each, and fitted with strong valve gates. The total cost of this important undertaking amounted to about £9000, of which £1000 was subscribed by Lord Stafford, and which Mr Loch estimates as the probable amount by which the estate of Sutherland might be benefited by excluding the flowing of the tide over some good land, and by obtaining about 400 acres of beach, which may in time push out a rough herbage, and thus gradually fit itself for culture." While these gigantic works were going on, the foundation of roads throughout the county was pushed forward with much energy, so that "in the space of twelve years," says Mr Loch, "the county of Sutherland was intersected in some of the most important districts with roads, in point of execution, superior to most roads in England." Previous to 1819 the mails were conveyed on horseback from Inverness to Tain, and from thence across the firths by foot-runners; but in July of that year a daily mail diligence commenced to run between Inverness and Thurso. The counties of Ross and Caithness, and the Marquis of Stafford on behalf of the county of Sutherland, contributed each £200 for two years in aid of this establishment; and, commenting upon the movement, Mr Loch says, that "in the history of the country there is no parallel of so rapid a change as has thus been effected in this distant corner of the island. Passing at once from a state of almost absolute exclusion from the rest of the kingdom to the enjoyment of the incalculable advantages of the mail coach system, at a distance of 802 miles from the capital of the kingdom, and 1082 miles

from Falmouth—the farthest extremity in the other direction to which this establishment extends; joining as it were by one common bond of intercourse the two most distant parts of the island,—the one situated at the extremity of the English Channel, the other on the coast of the frozen ocean."

The county having thus been opened up, it may be interesting to glance back at the condition in which, in an agricultural and social sense, the explorer would then have found it. Captain Henderson estimates the area of the arable land in the county in 1808, that is to say, land under wheat, bere, oats, pease, potatoes, turnips, and sown grasses, at 14,500 acres. It appears that by far the greater portion lay on the south-east coast, in the parts that form the main centre of the arable farming at the present day, while along the straths intersecting the county, and now under sheep, there were several thousands of acres under cultivation. The total annual produce of these 14,500 acres was estimated at £62,781, 2s. 8d., or a little over £4, 6s. 7d. per Scotch acre. The yield per Scotch acre of wheat is stated at 7 bolls, worth 30s. per boll or £10, 10s. per acre; bere, 5 bolls, worth 20s. per boll or £5 per acre; oats, 5 bolls, worth 15s. per boll or £3, 15s. per acre; pease, at 4 bolls, worth 20s. per boll or £4 per acre; potatoes, 12 bolls, worth 8s. per boll or £4, 15s. per acre; turnips, worth £6 per acre; sown grasses, 200 stones, worth 8d., or £6, 13s. 4d. per acre. A thousand acres of natural meadows, haughs, &c., are estimated to be worth £1, 6s. 8d. per acre, while pasture for 4291 horses is estimated at 10s. each or £2145, 10s.; ditto for 17,333 cattle at 10s. each or £8666, 10s.; ditto for 94,570 sheep at 2s. each or £9457; ditto for 1123 goats at 1s. each or £56, 3s.; and ditto for 270 swine at 3s. each or £40, 10s.;—in all for pasturage (exclusive of £150 charged for 500 red deer in Reay Forest), £20,365, 13s., which brings the total value of what is called the agricultural produce of 1808 up to £84,630, 11s. 8d.

The same authority states that the farmers of Sutherland at the period referred to were as diversified as the size of their farms. None of them were bred to farming in a regular manner from their youth,—the more opulent class were gentlemen who had been in the army, navy, or some respectable line abroad, who farmed partly for pleasure and convenience, and derived their profits from what they subset to the lower class of cottars or small tenants; by far the most numerous class were those whose fathers and grandfathers for many generations had followed the plough, or the black cattle and the goats in the mountains, men who never thought of changing or improving their condition, and whose means and professional knowledge were too limited to admit of change or amendment. The soil, climate, and short leases discouraged them, and, until the sheep-

farming circumscribed the extent of their hill pasture, they were chiefly dependent for a bare subsistence on the rearing of black cattle. As a rule they were "frugal and temperate in their habits; in spring and harvest they laboured hard, and the summer and winter were passed in ease, poverty, and contentment." In these times land was let not by the acre, but by the quantity of bere it required to sow it. A boll of bere usually sowed an acre; and arable land was thus let by the boll sowing, while the rent of pasture was calculated by the number of cattle it would maintain in the summer months. The arable land is reckoned in penny land, farthing, and octos. The penny land is generally allowed to contain 8 acres; an octo, of course, is 1 acre or a boll sowing, but this varies in proportion to the quality of the land—when of a superior quality the quantity is less, and *vice versa*.

The wadsetters prevailed on the south-east coast, while in the straths in the interior and on the western and northern coasts the arable land was mostly let in small lots of from 1 to 30 acres or boll sowings, each occupier having a proportion of *in-town* pasture, while "the mountains and moory hills were pastured in common by the cattle of the nearest tenants." The wadsetters took an extent of ground equal to about £200 Scots of valued rent, and occupied themselves from 30 to 50 bolls' sowing, letting the remainder to sub-tenants in farms of from £3 to £5 rent, besides services which Captain Henderson says were in some cases, unlimited. Mr Loch states that these wadsetters "exacted from their sub-tenants services which were of the most oppressive nature, and to such an extent that if they managed well they might hold what they retained in their own possession rent-free. This saved them from a life of labour and exertion. The whole economy of their farming—securing their fuel, gathering their harvest, and grinding their corn—was performed by their immediate dependents." In illustration of this statement, Mr Loch gives in his volume an interesting account of the rent payable by the sub-tenants of the farm of Kintradwell for the year 1811, from which the two following specimens may be given:—"Leadoch,—Angus Sutherland—6 hens, 6 dozen eggs, £4 in money, and 1 cover kiln-drying, clearing hay lands, shearing 48 stooks, threshing 12 stooks, 30 horses for a day leading ware, 4 days' work in harvest in cornyard, 1 spade and 3 spreaders of peats, and 2 days repairing peat road. Cottertown.—John Bruce—3 hens, 3 dozen eggs, £5, 1s. 3d. in money, and shearing 24 stooks, threshing 12 stooks, 2 days' work in cornyard, 1 spade and 1 spreader of peats, 1 day at peat road, thatching houses, clearing hay lands, 12 horses for 1 day leading ware, and half a cover kiln-drying. The total amount paid as rent by sub-tenants on this farm was,—in money, £145, 19s. 7d.; victual, £21, 11s. 3d.;

hens, £3, 18s.; eggs, £1, 7s. 6d.; servitude, £56, 10s.;—making, in all, £229, 6s. 4d." Mr Loch explains that Kintradwell "had been granted in wadset or mortgage for the sum of £800. In 1811 the wadsetter granted the residue of the term then unexpired, being eight years, to the late sub-tenant, Mr Macpherson, for a fine or grassum of £800, and the annual rent of £150. The value of the land in Mr Macpherson's own occupation amounted to £200 per annum, thus making the whole income derived by him from the farm £429 per annum. In this case there were three gradations between the landlord and the occupier of the land; in some instances, four." This obnoxious system became less popular as the present century advanced, the chiefs or landed proprietors found that they had more complete control over their people if they were made their own immediate tenants, and in many cases the proprietors remanded the wadsets or mortgages, leaving with the farmers what they had retained in their own possessions, and letting the remainder directly to the small tenants who were formerly the sub-tenants. Captain Henderson states, that about the year 1808, the rent of the arable land on the south-east coast was from 15s. to 21s. per boll sowing or acre, while, in some cases, 30s. or 35s. was charged for pasture attached to the arable land. In the straths, and on the western and northern coasts, rent was paid in accordance with the number of black cattle that could be reared on the farm, and its amount per acre could not, therefore, be ascertained. Wadset leases at one time frequently extended over two nineteens, but after the commencement of the present century, few of these were given. The duration of leases between the proprietors and principal tacksmen was generally nineteen or twenty-one years; and between tacksmen and sub-tenants (but leases between these were rare) three, five, or seven years.

The implements in general use at the commencement of the present century were of the most primitive description. The better-to-do farmers and proprietors had begun to use the modern Scotch plough, which cost from £3 to £4, 10s., but the small tenants still employ the old Scotch plough, made of birch or alder, with a thin plate of hammered iron on the bottom and land side of the head. "This plough," says Captain Henderson, "exclusive of the ploughshare, and sock, and plates, costs from 5s. to 15s., and is often made by the tenant who uses it. In the parishes of Assynt, Eddrachilles, Durness, and Tongue, and in other parts, the *caschrom*, a sort of spade, was in general use, while the clumsy old-fashioned home-made wooden harrows were worked by the smaller tenants all over the county, only those farmers who had improved ploughs having had harrows with iron teeth. On the larger farms there were a few of the modern horse-carts, which cost then from £12 to £16, but

among the smaller tenants, the well-known old basket cart was still in general use. Its cost was from 20s. to 25s. Fuel, manure, and other commodities were also sometimes conveyed in baskets attached to a clubber or saddle, on horseback. Only one threshing mill is spoken of as being in the county (at Midgarty) in 1808, and very few even of the larger farmers could boast of a winnowing machine.

Captain Henderson states, that "along the coast side of Sutherland the more opulent farmers plough their land with a pair of horses without a driver, and in some cases with four oxen abreast, with a driver. The smaller tenants, both along the coast and in the interior of the county, use four small *garrons* (horses) abreast in their plough, or perhaps two small ponies and two cows, all abreast, with a driver; and in cases where their lots are small, two of them join and furnish two ponies each, and plough their land jointly, the one 'holding' and the other 'driving.' These people have their land all in crooked ridges, broad in the middle and narrow at each end, in the shape of an S, and a green bank or cairn of stones between every two or three ridges. The course of cropping pursued on the south-east coast was, as a rule, first, pease or potatoes; second, bere or big, manured with ware or seaweed or farm yard dung; third, oats, and then pease, &c., again." Bere and oats were grown alternately in the interior and western districts, the former being as a rule sown in lazy beds with abundance of manure, which secured from 10 to 14 returns. Oats and rye were sometimes sown together, generally on land in poor condition, and the mixed grain was manufactured into a sort of coarse meal. A little wheat had been grown on the better farms on the south-east coast, chiefly at Dunrobin and Skibo, and it is said to have yielded from 8 to 10 bolls per acre; but Captain Henderson states, that "owing to distance from markets, the variable climate, and want of manure, the culture of it was given up." Bere gave from 4 to 7 bolls per acre, oats about 5 bolls, and pease from 5 to 6 bolls. During the first ten years of the present century, turnips were on their probation in Sutherland. Only a few small patches were grown by some gentlemen farmers, but they stood their trial well, and soon increased in popularity: the white and red top varieties were first sown. Potatoes played a very important part in the economy of Sutherland in these olden times. More than 1500 Scotch acres were planted with them every year, and they formed a very large part of the food of the inhabitants. The yield varied from 16 to 20 bolls per acre; and, in a favourable year, the quality was excellent. Only on a few farms on the south-east coast were artificial grasses sown, and these were clover and rye grass. The Argyle or West Highland breed of cattle had been

adopted at Dunrobin before the advent of the present century, and so well did they thrive there, that in 1807 eight milch cows were valued at £18 each, and the stots and heifers, from two to five years old, at an average of £15 each. The general breed of cattle, however, was the small black cattle of Skye and Assynt, "well shaped, short legged, and hardy; the colour in general black, with some exceptions." When mated with West Highland bulls these native cows produced excellent stock, and Youatt says that, though smaller than the cattle of Caithness, these black cattle of Sutherland were "far more valuable, requiring only to be crossed by those from Argyle or Skye to be equal to any that the northern Highlands can produce." Captain Henderson states that the four year old stots at Dunrobin farm weighted from 5 to 6 cwts. in the carcass, and the cattle of the country tenants from 240 to 400 lbs. avoirdupois.

Up to the winter of 1806–7, when they nearly all died of rot and scab, the old Kerry breed of sheep was almost the only variety of the fleecy tribe in the county. A few blackfaced sheep had been introduced before then, but, until the disastrous winter referred to, the ancient breed maintained its sway. The Kerry sheep were "small with good wool, some horned, others polled, some black, but the greater number white, and some of grey colour." They weighed from 28 to 36 lbs. in the carcass, and "the wool of from nine to twelve of them made a stone of 24 lbs." The introduction of Cheviot sheep, which began in 1806, will be referred to afterwards. Goats were kept in great numbers then, but, like the Kerry sheep, they were almost annihilated with scab and rot in the spring of 1807. The most general breed of horses was the native garrons—a thick low-set hardy breed, at one time reared all over the northern counties. They cost from four to ten guineas, were from 44 to 52 inches high, and were black, brown, or grey in colour.

The social habits of the inhabitants were, in these days, very primitive. Their food and mode of living are thus described by Captain Henderson—"The inhabitants near the coast side live principally upon fish, potatoes, milk, and oat or barley cakes. Those in the interior or more highland part feed upon mutton, butter, cheese, milk, cream, with oat or barley cakes during the summer months. They live well and are indolent; of course are robust and healthy. In winter the more opulent subsist upon potatoes, beef, mutton, and milk; but the poorer class live upon potatoes and milk, and at times a little oat or barley cakes. In times of scarcity,—in summer they bleed their cattle, and after dividing it into square cakes they boil it, and eat it with milk or whey instead of bread."

The real condition of those small tenants, who up to 1820 cultivated the glens or straths of Sutherland, is a matter of much

interest in connection with the agricultural history of the county, and therefore an extract on the subject from Mr Loch's work may not be out of place. He states—that "when that hardy but not industrious race of people spread over the county they took the advantage of every spot which could be cultivated, and which could with any chance of success be applied to raising a precarious crop of inferior oats, of which they baked their cakes, and of bere, from which they distilled their whisky; added but little to the industry, and contributed nothing to the wealth of the empire. Impatient of regular and constant work, all heavy labour was abandoned to the women, who were employed occasionally even in dragging the harrow to cover in the seed. To build their hut or get in their peats for fuel, or to perform any other occasional labour of the kind, the men were ever ready to assist, but the great proportion of their time, when not in the pursuit of game or of illegal distillation, was spent in indolence and sloth. Their huts were of the most miserable description; they were built of turf dug from the most valuable portions of the mountain side. Their roof consisted of the same material, which was supported upon a wooden frame, constructed of crooked timber taken from the natural woods belonging to the proprietor, and of moss-fir dug from the peat bogs. The situation they selected was uniformly on the edge of the cultivated land and of the mountain pastures. They were placed lengthways and sloping with the declination of the hill. This position was chosen in order that all the filth might flow from the habitation without further exertion upon the part of the owner. Under the same roof, and entering at the same door, were kept all the domestic animals belonging to the establishment. The upper portion of the hut was appropriated to the use of the family. In the centre of this upper division was placed the fire, the smoke from which was made to circulate throughout the whole hut for the purpose of conveying heat into its furthest extremities,—the effect being to cover everything with a black glossy soot, and to produce the most evident injury to the appearance and eyesight of those most exposed to its influence. The floor was the bare earth, except near the fire-place, where it was rudely paved with rough stones. It was never levelled with much care, and it soon wore into every sort of inequality according to the hardness of the respective soils of which it was composed. Every hollow formed a receptacle for whatever fluid happened to fall near it, where it remained until absorbed by the earth. It was impossible that it should ever be swept, and when the accumulation of filth rendered the place uninhabitable another hut was erected in the vicinity of the old one. The old rafters were used in the construction of the new cottage, and that which was abandoned formed a valuable collection of manure for the next

crop. The introduction of the potato in the first instance proved no blessing to Sutherland, but only increased the state of wretchedness, inasmuch as its cultivation required less labour, and it was the means of supporting a denser population. The cultivation of this root was eagerly adopted; but being planted in places where man never would have fixed his habitation but for the adventitious circumstances already mentioned, this delicate vegetable was of course exposed to the inclemency of a climate for which it was not suited, and fell a more ready and frequent victim to the mildews and the early frosts of the mountains, which frequently occur in August, than did the oats and bere. This was particularly the case along the course of the rivers, near which it was generally planted on account of the superior depth of soil. The failure of such a crop brought accumulated evils upon the poor people in a year of scarcity, and also made such calamities more frequent; for, in the same proportion as it gave sustenance to a larger number of inhabitants when the crop was good, so did it dash into misery in years when it failed a larger number of helpless and suffering objects. As often as this melancholy state of matters arose, and upon an average it occurred every third or fourth year to a greater or less degree, the starving population of the estate became necessarily dependent for their support on the bounty of the landlord. . . . . The cattle which they reared on the mountains, and from the sale of which they depended for the payment of their rents, were of the poorest description. During summer they procured a scanty sustenance with much toil and labour by roaming over the mountains; while in winter they died in numbers for the want of support, notwithstanding a practice which was universally adopted of killing every second calf on account of the want of winter keep. To such an extent did this calamity at times amount, that in the spring of 1807 there died in the parish of Kildonan alone 200 cows, 500 head of cattle, and more than 200 small horses."

The removal of these small tenants has already been briefly referred to, and it will now suffice under this head to say that the improved system of sheep-farming, which dates in Sutherland from 1806, had by 1825 spread over the whole county, including the straths formerly occupied by the small tenants; that by the latter date an improved system of husbandry had been introduced on the arable farms, and that a spirit of advancement had sprung up among all classes of the inhabitants, which has raised the county into its present highly creditable position in regard to both arable and pastoral farming.

The Progress of the Past Seventy Years.

Having perused the foregoing somewhat disconnected notes regarding the social and agricultural condition of the county about the advent of the present century, the reader will be the better prepared for a brief account of the progress that has been made since the spirit of improvement first took practical form in the county. This important event may be credited to 1806, in which year the modern system of sheep-farming, which has gained so wide a reputation for the county, was founded in Sutherland by Messrs. Atkinson and N. Marshall, from Northumberland, who, in that year, took an extensive sheep-walk from the Marquis of Stafford near Lairg, and stocked it with Cheviot sheep. The development of the sheep-farming will be more fully dealt with afterwards. Here it will suffice to indicate very briefly the rapidity of its growth and the enormous dimensions it has now reached. The county was found admirably adapted to the Cheviot sheep, and they fast drove out the Kerry and Blackfaced breeds. In 1811 they numbered about 15,000, while during the next nine years they increased to no fewer than 118,400. The next decade added about 38,000, and between 1831 and 1857 the number rose to about 200,000; while, since the latter year, they have exceeded that by from 16,000 to 40,000. It will thus be seen that during the first thirty years of the present century the occupation of the straths and mountains of Sutherland was completely revolutionized, and that the industry which has in later days so highly distinguished that remote part of the United Kingdom had, in little more than the short period mentioned, attained, so to speak, almost to its full manhood.

While the first thirty years of the present century wrought a great change in the interior of the county, that period also brought about considerable improvement in the districts in which arable farming prevailed. Captain Henderson states that, during the years between 1807 and 1811, "a general reform had begun in the management of land on the eastern coast of the county and that several farms were getting under the most approved rotation, in so far as the occupiers (intelligent farmers from Morayshire) believed the soil and local situation would admit of it; and perhaps better farm offices are not to be found in Scotland" than on some Sutherland farms. The reform thus spoken of spread gradually through all the arable districts of the county, wiping out all relics of the darker ages, such as wooden ploughs, basket-carts, primitive systems of rotation, and feal houses, and introducing in their stead an order of things entirely new. Better attention was bestowed on the rearing of cattle, and the stock of cattle, as well as that of horses and sheep, was very greatly improved. Fields were squared, fences erected, new houses built,

service or local roads made, and other improvements effected, so that by 1830 the face of the country had become wonderfully changed. The late Mr Patrick Sellar, who visited Sutherland along with other Morayshire men in 1809, and found it entirely devoid of roads, harbours, farm steadings (excepting one or two), or any other signs of modern agriculture, wrote as follows, in 1820, to Mr James Loch, commissioner on the Sutherland property:—"At this time (1809) nothing could have led me to believe that in the short space of ten years I should see, in such a country, roads made in every direction; the mail coach daily driving through it, new harbours built, in one of which upwards of twenty vessels have been repeatedly seen at one time taking in cargoes for exportation, coal and salt and lime and brick-works established, farm steadings everywhere built, fields laid off and substantially enclosed, capital horses employed, with south country implements of husbandry, made in Sutherland, tilling the ground, *secundum artem* for turnips, wheat, and artificial grasses; an export of fish, wool, and mutton to the extent of £70,000 a year; the women dressed out from Manchester, Glasgow, and Paisley; the English language made the language of the county; and a baker, a carpenter, a blacksmith, mason, shoemaker, &c., to be had as readily and nearly as cheap, too, as in other counties." About 1809 Mr Sellar entered on a lease of the farm of Culmaily, in the valley of Golspie, and about a mile from that town, at a rent of 25s. per acre, with an advance at 6½ per cent. of £1500 to assist in improvements, the extent of the farm being 300 Scotch acres. This enterprising gentleman at once set to work, and in a few years had the whole of the farm reclaimed, a considerable portion of it from moor and moss and rough pasture,—had erected upon it an excellent dwelling-house, farm steading, and thrashing mill,—and had it brought to a high state of cultivation. He also took on lease the adjoining farm of Morvich, and between the two he had reclaimed over 250 acres before 1820. On the neighbouring farms of Kirkton, Drumroy, and Dunrobin Mains, and at Crakaig and Skelbo, similar improvements were executed about the same time; while at different parts along the south-eastern coast smaller reclamations and improvements were carried out, partly by the tenants and partly by the proprietors.

The want of reliable statistics makes it impossible to give even an approximate idea of the number of acres of land reclaimed in the county during any given period of the first half of the present century. It has already been stated that in 1808 the arable area was estimated at 14,500 Scotch acres, or about 18,125 imperial acres, but, through the removal of the small tenants from the straths in the interior during the second decade of the present century, and the turning of their crofts into sheep pasture, that

area must have been reduced by a few thousand acres—the exact extent cannot be ascertained. The first properly organised inquiry into the agricultural statistics of Sutherland was made in July 1853 by the Highland and Agricultural Society of Scotland at the desire of the Board of Trade. According to that inquiry the arable area in 1853 was 22,022½ acres, or only 3,897½ acres more than in 1808—not a very large increase for a period of forty-five years. It must be remembered, however, that the statistics of 1808 were more roughly gathered than those of 1853, and that, as already stated, the removal of small tenants and the introduction of sheep-farming threw a large extent of arable land out of cultivation. The following table shows the addition that has been made to the arable area of the county during the past twenty-six years:—

	Acres.
Arable area in 1853, . . .	22,022½
„ „ 1879, . . .	29,441
Increase during last twenty-six years, .	7,418½

As shall be afterwards shown, a large portion of this increase has been effected by the Duke of Sutherland, within the last few years, at Lairg and at Kinbrace; while the main part of the remainder has been made up by the reclamation of pieces of land, varying in extent from 50 to 200 acres, on sheep farms throughout the county for the purpose of producing winter food for the sheep. As a rule these latter reclamations have been executed by His Grace, the tenants paying interest on the outlay.

The progress of the present century is better indicated in the valuation of the county than in its arable area. The valued rent of the county in 1802, as entered in the Records of the Exchequer at Edinburgh, was £26,193, 9s. 7d. Scots, or about £2,182, 15s. 9d. sterling; while in 1808 Captain Henderson estimated the real rent of the county at £16,216, 12s. 6d., including about £1750 for fishings and kelp, and about £200 for houses in the burgh of Dornoch. The following table shows the valuation at various times since the commencement of the present century:—

Valuation in 1815, . .	£33,878	0	0
„ 1849, . .	39,470	0	0
„ 1859–60, . .	52,379	0	0
„ 1864–65, . .	57,339	0	0
„ 1869–70, . .	62,629	0	0
„ 1874–75, . .	80,105	10	0
„ 1878–79, . .	95,813	13	2
Increase since 1815, . . .	£61,935	13	2
„ 1859, . . .	43,437	13	2

These figures bear indelible testimony to the great skill and enterprise that have been displayed during the present century

by the proprietors and tenants of Sutherland. There is but a small portion of the county suitable for arable farming, and therefore the increase in its arable area has been less during the past fifty years than in the other Highland counties, but its natural resources, such as they are, have been developed in a manner, and to a degree not surpassed in the history of any other county in the kingdom.

The Duke's Land Reclamations.

The Duke of Sutherland's land reclamations have perhaps earned a wider reputation than any other agricultural operation ever undertaken in any part of the world. Though commenced only nine years ago, more matter has already been written and published on the subject in newspapers and magazines than is required to form an ordinary modern three-volume novel; and thus the agricultural public must already be pretty familiar with the details of the work. In such a report as this, however, it is desirable that so prominent a feature in the agricultural history of the county should receive due attention.

The Reasons that led to the Reclamations.—The reasons that led the Duke of Sutherland to contemplate these reclamations may first be noticed. As may be inferred from the great disproportion between its arable and grazing areas, the county of Sutherland, the bulk of which, as has been shown, belongs to His Grace, is, in the matter of food, far from self-supporting. The consumption of oatmeal exceeds the home production; and, as the mountains and straths of the county carry a greater number of sheep in summer than these, aided by the available production of the arable districts, can sustain in the winter season, a large portion of its sheep stock has to seek winter food beyond its bounds. Nine years ago it was stated by the late Mr Kenneth Murray of Geanies, that for oatmeal and turnips at least £25,000 went off the Duke of Sutherland's estate every year. It was therefore natural that His Grace should have long cherished a desire to alter this state of matters, and, if possible, increase his arable area so as to raise a sufficiency of oatmeal for the inhabitants, and of winter food for the fleecy animals that fare so sumptuously on the Sutherland hills in summer.

Mr Kenneth Murray's Report.—In 1870 the late Mr Kenneth Murray of Geanies, Ross-shire, a gentleman at once large-hearted, widely intelligent, and of vast experience, was consulted on the subject by His Grace. After making a careful survey of the portions of the estate that seemed most suitable for reclamation, Mr Murray drew up and submitted to his Grace an exhaustive and highly-interesting report. The substance of the more important parts of that document (with which,

for perusal, the writer has been kindly favoured) will no doubt be read with appreciation. At the outset, Mr Murray states that he is "fully satisfied that a very large area in the neighbourhood of Lairg, lying westwards along the banks of Loch Shin and northwards on the banks of the Tirry River, is capable of being made greatly more productive, either as arable land or by surface improvement, and that the measure is recommended by many considerations of public policy as well as of private interest." Fixing on this spot as the seat of the first series of improvements, he proceeds to discuss the reasons he had heard against the reclamations. "The climate," he says, "is not nearly so cold as in many other districts which are in profitable cultivation; and on the furthest west margin, to which I would at present extend improvement, I have seen excellent crops of oats and barley ripened as soon as the average of the north of Scotland generally, and much sooner than is usual in Caithness and the heights of Aberdeen and Banff. Turnips and potatoes also grow perfectly at Shiness. From 110 to 150 feet higher than the existing fields of Shiness, there are traces of corn cultivation in old times, with the rude appliances of these days. It is said that the district is especially liable to mildew —that heavy mists lie by the side of the lake, frequently causing loss both to grain and green crops. I have seen those mists on several occasions, and once went to examine them; and I have no doubt that they are injurious. But I am equally satisfied that they are removable, and that they will disappear as a consequence of the improvement of the district. There are large 'floes,' or green mosses full of stagnant water, in the locality, and great want of drainage everywhere; and from precisely similar experience in a smaller area—as well as from many recorded instances all over Scotland—I am satisfied that these mists will be gradually removed. I grant that they point to the necessity of a larger drainage operation, but to no other difficulty. It is said that the locality is so exposed that the wind does injury,—to this I attach no importance. During spring, summer, and autumn, I have no doubt the influence of wind is neither more nor less than in other unsheltered districts, and that it is more temperate than the extreme eastern coasts. In winter I have no doubt it is a wild place for drift,—but that is an argument against its pastoral character, not against reclamation. And, of course, I am to recommend planting for shelter, and good stone or turf fences for sub-divisions. There was formerly great force in the reasons urged in respect of the inland position of the district, and the cost and difficulty of communication; but these are now removed by the railway. The most distant acre proposed to be reclaimed will not be seven miles from a station." Proceeding to state the arguments

in favour of the operation, Mr Murray makes reference to the ever-increasing demand for arable land as an outlet for capital and industry, and says that he could find no reason of any kind connected with the soil against the operation. "Its character is various, but it is all quite adapted for oats and green crops, except a few hard *knowes* and wet hollows, which are sometimes flooded." Oats and turnips, he points out, are the crops most required in Sutherland, and he adds,—"The value of turnips has risen so much that it has arrested, I am certain, the progressive value of hill pastures in the north. And more than that has happened. Before the recent extensive reclamation of land in the old districts of Ross and Inverness, the hill sheep used to have *outruns* of heather or other coarse pasture, to which the turnip was an adjunct merely; and they not only wintered more cheaply, but the wintering was better for them. Now, penned upon the turnip fields, occasionally getting out only on to short artificial grass, they lose a great deal of the hardiness of their nature, and the result is that a great many have to be sent back again for a second wintering, or they would die. This is a very serious matter—is becoming more so every year—and, in view of these facts, a large reclamation of land in the centre of Sutherland has additional interest.

As all land improvements must proceed gradually, and improvement invariably leads to further improvements, I would propose to deal mainly, at present, with the shores of Loch Shin and the immediate banks of the Tirry. I entertain no doubt that for every acre which may be cultivated within the first twenty-one years, half as many more will be reclaimed in the succeeding lease, and probably at a less expense than those which are made arable now. Experience teaches that over-exertion in the matter of land improvement is a great mistake, and that, in fact, it often annuls for a time the real benefit of what was otherwise a true measure of improvement. Still, from the character of the subject, and the necessity of improving the climate, I hold that this particular operation must be extensive to be successful." Mr Murray indicated that he would propose to make in all 1175 acres of arable land—575 acres of which he would have divided as follows:—

1 Farm of 125 acres	)	Having 1400 acres of pasture
1 „ 200 „	}	to be conveniently divided
1 „ 250 „	)	among them.

The remaining 600 acres would be laid off into fifteen farms of 40 acres each, with 600 acres of pasture in common, and 200 acres to be improved by the tenants. He also proposed to add to the arable areas of the farms of Shiness and Dalchork, so as to make these farms self-supporting. Mr Murray then entered

into a detailed scheme for carrying out the improvements, dealing first with drainage, which, though absolutely necessary, did not appear to him as likely to be either difficult or expensive. He placed the cost of drainage at £5 per arable acre, and £1 per acre of outrun. Speaking of the "measures necessary for breaking up the surface," he gave it as his opinion that probably four-fifths of the whole area could be quite well ploughed by horses or oxen. He would not say that thereby as perfect work would be made as by the more expensive process of trenching,—except in the swamps and meadows where, after drainage and some labour on the surface, a common plough would do the work quite well. But then, in regard to the cost, he estimated that, while ploughing by horses or oxen would not cost more than £2, 15s. per acre on an average, including 5s. per acre for accommodation for men and stock employed, trenching would cost at least £10 per acre. Referring to the question of employing steam, he said—"But if it is possible to do the work by steam-ploughing (of which I am not able to judge), the cost may be decreased; for I am certain very good work can be done at the price I have named by means of horses and oxen. The difficulty of employing steam is the risk caused by stones; and though there are very large areas where no stones will occur, these areas, on the other hand, should be ploughed for less than £2, 10s. per acre (say, from £1 to £1, 10s.), because a less depth would be necessary." Detailed instruction was also given as to clearing the broken surface of stones, which was calculated to cost £2 per acre; building dwelling-houses and farm offices, the cost of which for the three farms was estimated at £5 per acre, and for the fifteen smaller holdings, at £6 per acre; and fencing, the cost of which was placed at £2 per acre. In regard to fencing, he says—"There can be no doubt at all that, as regards the intermediate fences, stone dykes are the best, but their cost would be very great, especially as I have no expectation of obtaining anything like the quantity of stones necessary without quarrying. It will, therefore be necessary to place stone fences only in the most exposed situations on each farm. I think that turf fences with wires on the top should be largely used, and, with ordinary attention, they may last for all time. These turf dykes should be made before the land is broken up, and they should be built like stone fences, but starting from the surface with a broader base and having more slope. They should also be erected only in autumn and winter, never later than February." As to road-making, he said there would be no difficulty or any great expense—less than £600. He had reason to believe that stones for all the buildings would be got in the river Tirry, and adds: "There is a rare advantage in possessing lime, both for building

and top-dressing the land at Shiness; this is indeed a most important element in the whole matter. The railway makes all carriages nothing more than the average of the country." With regard to outruns and plantations, he says: "I attach much importance to these outruns in connection with the proposed reclamation, though I trust future generations will see their areas gradually encroached upon by the plough. With drainage and lime, I expect they will be made very valuable. The drainage I estimate at £1 per acre, and we must add 10s. per acre for ring fences. Throughout these outruns—and wherever it can be properly arranged within the bounds of the area to be made arable — plantations should be at once formed, having reference to shelter chiefly. In exposed places it will be of no use, I fear, to plant less than fifty-acre spaces; but on the face towards Loch Shin, much smaller belts may be formed. The soil, however, is not favourable for planting, except in a few spots which I have marked on the plan, and profit cannot be directly regarded from this operation. It is fair, therefore, to charge the great part of the probable cost to the work of reclamation; and I propose to add £600 under this head—or say, at the rate of 10s. per acre." Mr Murray concluded his admirable report by considering the question of how the new land should be let, and added an abstract of the probable cost and probable revenue. From this abstract it appears that he estimated the total cost of improving the 1175 acres, including draining, ploughing (which was estimated at £3 per acre, to cover the trenching of a few spots), clearing away stones, farm buildings, fencing, forming roads and bridges, and plantations for shelter, at £21,737, 10s., or £18, 10s. per acre. The draining and fencing of the 2200 acres of outruns were estimated at £3300, or £1, 10s. per acre; making the total probable outlay £25,037, 10s. The average rental of the three larger farms for the first thirty years was estimated at £1, 3s. 4d. per acre, or £670, 16s. 8d. in all; and that of the fifteen smaller possessions at 17s. 10d. per acre, or £535 in all,—giving a total average annual revenue for the first thirty years of £1205, 16s. 8d. The annual value of the land before being improved was stated at £150, which left, as the probable "improved rental," £1055, 16s. 8d., and which would be equal to a return of more than 4 per cent. per annum on the estimated cost of the improvement.

Beginning and end of the Lairg Improvements.—Mr Murray's report was favourably entertained by the Duke. Having failed in many efforts to induce contractors to undertake the recommended reclamations either by manual and animal labour or by steam, His Grace at last took the matter in hand himself, and in the beginning of September 1872 commenced at Lairg with

an old set of Howard's steam-plough tackle which had previously been employed by His Grace in reclaiming a piece of moss-land near Uppat. Preparations for the works at Lairg had been going on for some time previously. A large part of the farm of Dalchork, on the south-east side of the Tirry river, had been drained, and about 20 acres trenched by manual labour. At the very outset, as predicted by Mr Murray, the process of ploughing the Lairg land by steam was almost brought to a standstill by the numerous large stones and tree-roots that lay embedded in the soil. Breakages were constantly occurring, and it seemed as if the attempt would have to be abandoned. Just in time, however, a happy idea occurred almost simultaneously, it is said, to the Duke, his private secretary, Mr Wright, and to his farm manager, Mr John Maclennan. This was the substitution on the plough of a revolving disc for the ordinary culter; and small though the alteration may seem, it has proved the key to the colossal results that have followed. Without it the ploughing by steam would to a certainty have had to be given up. The disc culter has long been in use in many parts of the world, but in this application there is the new element of fixing the disc so that it cuts about two inches lower than the share of the plough. It will thus be seen that by being so fixed, the revolving culter carries the plough over all obstacles, whether stones or roots, leaving them bare, to be taken out by men who follow in the furrow. The patent for this application of the disc culter, it may be mentioned, is held by Mr John Maclennan, who is now tenant of the farm of Mains of Resolis, in the Black Isle, Ross-shire. The Howard tackle, however, was found much too weak in every respect for such heavy work, and application was made to Messrs John Fowler & Co., Leeds, who willingly came forwarda to assist the noble Duke in the development of his views. These preliminary experiments were carried out on the farm of Dalchork, but early in the summer of 1873 steam-ploughing was commenced on the stretch of land specially reported on by Mr Murray, and lying nearly in the form of an angle between Loch Shin and the river Tirry. Here the huge plough, made specially for the reclamations by Messrs Fowler & Co., was kept almost constantly at work when weather permitted during four successive years, having in that time turned over 1829 acres, or an average of fully 457 acres each year.

At this stage a few words as to the character of the land at Shiness may be of interest. It has been seen that the stretch of land recommended for reclamation by Mr Murray, and which has all been made arable, lies in the form of a rough angle, bounded on the south-west by Loch Shin, and on the south-east by the river Tirry. An undulating ridge runs along the centre

of the angle, rising in height towards the west, and from this ridge the land slopes to the loch and the river with an easy and nearly equal gradient, that towards the river being the steeper. Between the Tirry and the range of hills that shut in the valley on the north and north-east there lies a long stretch of deep mossy land richly covered with heath, cotton grass, and other plants. When in its natural state, the surface of the land reclaimed was rather rough and uneven, but still no serious obstacles in this respect had to be contended with. The subsoil varies slightly, but is good in all parts, the most general being a porous mixture of gravel, clay, and sand, with numerous conglomerates and sandstones embedded in it. The surface soil exhibits greater variety. In some parts it is of a clayey character, in others loamy, in others shingly and light, in the hollows deep spongy moss, the most general being a mixture of clay, black mossy loam, and shingle or sand. All over, with the exception of a few of the more elevated spots, it contains a quantity of decayed vegetable matter which, as it becomes decomposed, will form, and has already been forming, a valuable stimulant to the crops. From the fact that Shiness is surrounded by hills, it might be supposed that it lies at a great elevation; but such is not the case, for the highest point of the new land is only about 450 feet above sea-level—not half the height of many thousands of acres of arable land in the counties of Aberdeen and Banff. The rainfall is stated at a little over 40 inches per annum.

During the progress of the work there, the Shiness valley presented a novel scene of activity. When the operations were in full force no fewer than fourteen steam engines were "puffing" away at one time, and several hundred workmen and many horses busily employed. Drainage, ploughing, clearing off stones, harrowing, erecting fences, making roads, building houses, were all in progress at once, creating a stir and bustle which, in a valley hemmed in by hills on all sides, could not have failed to impress the visitor as marvellous. The Duke of Sutherland, while residing in the county, visited the works almost every other day, closely overlooking the progress of every operation, and frequently giving valuable assistance in the surmounting of difficulties. His Grace is well known to possess an extensive and intimate acquaintance with machinery, and not a few of the improvements that have made the Sutherland land reclamation implements so thoroughly efficient as they now are were suggested by the Duke himself. It may be mentioned that among the noblemen and gentlemen who visited the reclamations was H.R.H. the Prince of Wales, who, while residing at Dunrobin Castle in 1876, honoured the Duke by visiting Lairg and minutely inspecting the works. On the occasion of the High-

land and Agricultural Society's Show at Inverness in 1874, the Society, in compliance with an invitation from the Duke of Sutherland, sent a deputation to visit the reclamations. The deputation were conveyed from Inverness to Lairg and back by special train, and conducted over the works by His Grace, Mr Murray of Geanies, and Mr David Greig (of Messrs Fowler & Co.). A very large number of farmers and others availed themselves of the opportunity thus afforded of visiting works which had, even previous to 1874, earned the reputation of being the most gigantic of the kind ever undertaken in the United Kingdom; and whatever may have been the opinion entertained of the quality of the work accomplished by the machinery as it then existed, utter astonishment was the one feeling expressed as to the magnitude and novelty of the undertaking. The writer visited Lairg several times during the progress of the reclamations, and was therefore able to note the advances made in the quality of the work done, and in the efficiency of the implements. The improvement effected on the implements in the course of the first two years was really marvellous. At the outset the work was often tedious and disheartening, breakages having been of frequent occurrence, but the first two years saw almost all these overcome, and a point towards perfection reached which could have been attained only by distinguished skill backed up by long patience, indomitable perseverance, and great expense. One instance may be given to show the thoroughly satisfactory condition into which the implements had been brought during the first two years. Towards the end of 1874 two powerful engines were placed upon a section of rough heath and bent-covered land extending to 60 acres, and before leaving it the following spring they converted it into a well-prepared bed for grain and grass seeds, which in fact they also covered by the harrow and roller.

It should be mentioned that Mr Kenneth Murray continued to superintend the works up till his death in July 1876, which was lamented alike by the rich and the poor, for, by all with whom he ever came into contact, he was looked up to and respected, even beloved. On an elevated spot overlooking the new land a handsome monument was erected to his memory by His Grace the Duke of Sutherland. Designed by Mr William Fowler, the Duke's architect at Golspie, and erected under his superintendence, the monument is in the form of an obelisk about 30 feet in height, the base being formed of three rows of large rough boulders taken from the reclaimed land, and the monument proper of dressed freestone from Dunrobin quarries. On one side there is the following inscription:—

TO

KENNETH MURRAY OF GEANIES,

OF WHOSE DEVOTION TO
THE CAUSE OF AGRICULTURE
AND ATTACHMENT TO
THE DUKE OF SUTHERLAND
AND HIS PEOPLE,
THESE RECLAIMED LANDS
ARE
THE BEST MEMORIAL.

On another side—

K. M.
OBT. JULY 23D 1876
"SI MONUMENTUM QUÆRIS
CIRCUMSPICE."

On the third side there is a representation of the "Sutherland Plough," and underneath is the following inscription:—

THE WORKS
WERE COMMENCED IN 1873
AND COMPLETED IN
1877.

The Modus Operandi.—The first process was to cut large ditches to draw off the surface water from the land to be reclaimed. From the passing high-way (leading westwards from Lairg railway station) a service road was run across the Tirry towards the proposed sites of the new homesteads. It was formed of hand-laid stones, cost 2s. 6d. per lineal yard, and, when nearly completed, carried, without being damaged, the ponderous engines used in ploughing, which weighed about 19 tons each. At the same time, suitable belts were planted with Scotch fir, with the view of providing shelter. When it was sufficiently hard and dry, the land was first ploughed, while the more mossy parts were drained and allowed to firm a little before being turned over. Most of the implements used in these important reclamations have been constructed specially for the work they perform, and therefore deserve to be noticed separately. It will thus suffice to state here that, as worked at Lairg, the plough turned over a furrow about 2 feet deep, and that the "Duke's Toothpick," or the anchor-like hook that followed the plough, loosened the subsoil without throwing it over the furrow. The large stones were taken out by men who followed the plough: and, when large tree-roots were met with, the wire-rope was

detached from the plough and fixed on these roots, and thus they were torn from their mossy beds with marvellous despatch. In this operation extraordinary masses of earth were sometimes moved. In cases where it was found more convenient, dynamite was used in dislodging these roots, which were very numerous in some parts; and they were hauled by steam to the edge of the field or section on a huge platform, shaped like a sledge, about 24 feet long by 12 feet wide. When dry and cut up they made excellent fuel for the engines, and were largely used for that purpose. Another still more novel process was the removal of living trees by steam. Along the ridge of the tract of land reclaimed there were patches of dwarf mountain ash and birch, and one of the many happy ideas hit upon in connection with the works was the removing of these trees by steam. Short lengths of chains were cast round the trunks of three, four, or five or more trees, attached to each other and finally secured to the rope of an engine which stood near, and thus four or five trees were pulled up at a time with as much ease as a man would pull a turnip. One great advantage in this system is, that most of the roots are torn up along with the trees. On the more mossy parts the drains were cut to an average depth of 4 feet, and tiles, made at the Duke's own tile-works at Brora, were laid on deals of wood. In the drier and harder parts the drains ranged from 3½ to 4 feet in depth, and were formed of stones, which were conveniently obtained, as the land in these parts was ploughed before being drained. The stones remaining on the surface of the ploughed land, after the drains had been formed, were removed on sledges worked backwards and forwards between two engines on the same principle as the plough. When the loaded sledge had come to a standstill at the edge, the engine at the other side of the section was set in motion, tilting the sledge overhead, relieving it of its load, and pulling it back to where the men waited to reload it. Having thus been ploughed, drained, and cleared of stones and roots, the land, which had perhaps lain in the furrow over a winter, was thoroughly "made," and prepared for cropping by rank harrows worked by steam similarly to the plough and sledges. Fences and farm buildings were then constructed, generally in accordance with the recommendations of Mr Murray, the houses being commodious and substantial.

How the New Land has been Laid Out and Employed.—As has been seen, the extent which Mr Murray proposed to reclaim at Lairg has been exceeded by 654 acres. The scheme of division which he originally recommended has also been in some degree departed from. The 1829 acres reclaimed at Lairg, exclusive of the land taken in on the farm of Dalchork, have been divided as follows, the extent

of outrun or hill pasture allotted to each farm being shown alongside:—

	Acres arable.	Acres outrun.
Colaboll, ...	345	120
Achnanearain, ...	330	200
Achadaphris, ...	475	500
Lubvrec, ...	405	4300
West Shiness, ...	217	4000
Achnanearain Lots, . . .	37	—
Achadaphris „ . . .	20	—
Totals, ...	1829	9120

The farms of Achadaphris, Lubvrec, and Shiness, are still held by the Duke, and are entered in the Valuation Roll for 1878–79 at £400, £300, and £500 respectively. The greater part of the outrun originally belonging to Shiness farm (the farm on which the reclamations took place) is still attached to that farm, which carries a stock of over 2000 sheep. The Master of Blantyre, the Duke's nephew, holds the other two farms, Colaboll and Achnanearain, at a rent of £526, 12s. The small lots are let, along with a common outrun, to seven tenants, whose arable areas range from 6 to 20 acres in extent. They have good slated houses and suitable steadings, and pay from 18s. to 26s. per acre of rent for the arable land, and from 2s. to 2s. 6d. per acre for the outrun, which is enclosed by a substantial fence. Of these small tenants one is a mason, another a carpenter, and the other five are respectable labourers, who in their spare time get employment on the larger farms.

No fixed rotation has as yet been adopted, but the land is being worked in that direction. Some of the poorer parts have been laid down in pasture with rape and grass seeds, and these have turned out well, maintaining stock in good condition. Oats and turnips are the crops generally grown. Swiss oats yield from 4 to 6 quarters per acre, and weigh on an average 38½ lbs. per bushel. Sandy oats give a similar yield, and weigh from 41 to 42 lbs. Longfellow oats grow well, but are rather late in ripening. Canadian oats have also been tried on Shiness farm, and have been found to be early, weighing about 44 lbs. per bushel. In good seasons harvesting begins about ten days later than on the south-east coast of the county, but this year (1879) there has been very little difference. The Swiss oats at Lairg, and the barley on the coast are usually ready for the reaper about the same time, and this year all the Swiss oats at Lairg, covering 160 acres, were secured in excellent condition by the 25th of September. In spring the land is in a fit condition for cropping in good time, and those who reside in the new arable district say that the winter is not more severe than in other parts of the county of similar elevation, and that they are not

troubled with mildew. On dry land, turnips have always been an excellent crop, and the average yield of potatoes is about equal to that of the county generally. For oat crops from 2 to 3 cwts. of superphosphate of lime are given per acre, while for turnips, about 2 cwt. of superphosphate, 2 cwt. dissolved bones, and 1½ cwt. Peruvian guano, or some similar commodity, is allowed, along with 20 loads of farm-yard manure. It may be mentioned that the first crop grown on the land was oats, and that it was sown out into pasture in some cases, and in others not. Having been previously cleared of stones, and "made" on the surface, the land was all heavily limed, manured with about 4 cwt. of superphosphate, and 1 cwt. of kanit of salt per acre, or with some similar mixture, and then sown with oats towards the end of April or beginning of May, the stiffer looking parts being afterwards top dressed with nitrate of soda.

The new farms have been found to be very healthy for stock. On Shiness farm there is a permanent stock of Cheviot sheep, consisting of ewes and wethers, and lately they have been selling at high prices—the wethers this year (1879) at 44s. each, and the ewes last year at 39s. 6d. each. The other farms are intended for wintering hoggs, and they suit this purpose admirably, having kept 2500 hoggs of the best class during last winter (1878–79) in excellent condition. This year 3000 hoggs have been sent for the winter on the farms of Colaboll and Achmanearain, Achadaphris, and Lubvrec. Last winter, in addition to the number of hoggs mentioned, Achadaphris fed 24 cross cattle, and kept 50 Highland cattle in "store" condition; Shiness wintered 70 store cattle and 12 Highland ponies; while Lubvrec fattened 22 polled cattle, and wintered 40 store cattle—all good heavy animals, which were sold at from £20 to £26 each. The feeding cattle got an allowance of about 4 lbs. each per day of bruised oats and linseed cake, but the store cattle were kept solely on turnips and straw, being allowed to run out daily upon the rough land.

In some cases it has been found necessary to re-drain the land, the original drains having in some way or other failed to work satisfactorily. As yet, too, the land has to be cultivated with great care. It is not old enough to be thoroughly "made." When much of the sod is turned up it gets dried, and becomes troublesome. No weeds as yet, however, have found their way into the land, and the green crops can therefore be laid down more cheaply than in old land. The land seems to suit grasses admirably, and in good seasons they grow luxuriantly.

The education and spiritual wants of the newly formed arable district have not been overlooked by the Duke. A substantial school was built by him in the centre of the reclaimed land, and the attendance of children, which is annually increasing, numbers from 50 to 70. A male teacher is employed, and the school has

now been transferred to the Board. The school is also used for religious meetings, and a missionary of the Free Church of Scotland officiates in it every Sunday.

The Kildonan Reclamations.

Not daunted by the heavy outlay which had been entailed at Lairg, the noble Duke adhered to his intention to carry his scheme of land reclamation still further. The strath of Kildonan seemed the next most attractive locality, and accordingly the plant was removed thither in the spring of 1877, and operations immediately commenced. Prior to this the Duke's present manager, Mr George Greig, Edinburgh, was invited by His Grace to make a careful inspection of the soil and subsoil in Kildonan, and also to report as to the probable cost of the improvements per acre. The character of the works now being carried out so systematically in that district will be best understood by a perusal of the substance of Mr Greig's report.

The operations in Kildonan were at the outset confined to the farm of Auchintoul, which was previously occupied as a sheep farm by Major Houston of Kintradwell, who willingly gave up his lease to enable the Duke to proceed with the reclamations. The farm extends to 30,000 acres, and carries a stock of about 5000 head of as fine Cheviot sheep as any in Sutherland. The stock being divided into seven "hirsels," Mr Greig laid off the land to be reclaimed in seven separately enclosed sections, the intention being to provide for each "hirsel" the necessary quantity of winter food for the young sheep, and as much as would enable the tenants to fatten their wethers themselves, and send them directly to the market. The seven enclosures or sections laid off extend in all to 282 acres, and alongside these, three sections of improved pasture land, measuring 188 acres, were enclosed. These ten sections were laid out by Mr Greig with a view to combine compactness with an equal division of the land, and as much facility as possible for working the land by steam power. The surface soil over the whole of the area covered by these sections "may be described," says Mr Greig, "as more or less peaty, and from a foot to several feet in depth, the greater portion of it being of the shallower depth. It lies on an open subsoil of something that might be described as between sand and gravel with a little clay, a subsoil which I look upon as being the very best, if within reach of this class of surface soil." The subsoil was also examined and analysed by Mr Falconer King, Edinburgh, who reported that—"It does not show the usual reactions of subsoils, indicating that it is free, at all events, of the deleterious substances commonly present in these. It does not contain any hurtful soluble salts of iron, and it is very

dry, containing only 1·70 per cent. of water. It is very light and free, and would by itself, perhaps, hardly prove a very productive soil, but I am of opinion it would serve admirably for the purpose of mixing with other heavier, damper, or peaty soils, in order to ameliorate their condition or texture." In regard to the ploughing, Mr Greig says—"It is proposed to turn the surface to the depth of from 10 to 12 inches, and to subsoil where necessary to a further depth of from 4 to 8 inches. An effort shall be made by a new construction of subsoiling tine to throw part of the red subsoil on the surface of the turned over mossy furrows." With such an extremely open subsoil he thought it would be injudicious to carry out at the beginning the usual system of drainage, and recommended the laying down of the leading drains in the usual way, and the running from these of an occasional branch drain to test the effect, all these being so arranged that their number could be afterwards increased, if found necessary, without any confusion of the drainage system. Mr Greig says—"I had a great number of holes dug 3 or 4 feet deep, and not only found no water, but some which was run into the holes disappeared. The land, lying as it does with a nice undulating surface, and covered with a close covering of peat, almost impervious to water, and acting like a roof to the subsoil, has, in the past, been kept perfectly dry by this roof or covering, carrying the water over the surface into the burns. This was the condition in which I found it, but I am not prepared to say what the change may be after we have broken the peaty surface described as a roof covering. It is quite clear after this is done that the whole of the water which may fall upon this land will have to be discharged, not over the surface as before, but through the subsoil, and it is quite possible that, notwithstanding the open character of it, more drains than I would be disposed to put in at present may, with the altered circumstances, be found necessary." After referring to the clearing away of stones, fencing, and building, Mr Greig adds—"The principle on which the operations are to be undertaken is, that each section of the work, such as draining or clearing, shall be entirely separate, and managed by a person who alone will be responsible to the manager. The progress made in each section will be given every fortnight alongside a note of the sum expended, so that I may check at once any expenditure that is made without an equivalent in result. Contract work will be introduced as far as possible. It is intended to sow the whole arable land, to the extent of 282 acres, with oats next spring, and to undertake the improved pasture by liming, surface draining, and sowing out in grasses, whins, and broom. The lands laid off for permanent pasture embrace all the low lying and sheltered parts of the farm, and will be found admirably adapted for sheltering the

ewes in the time of lambing, and the sheep generally in the time of storm." In regard to the cost of these reclamations, Mr Greig estimated it at under £20 per acre for arable land, and £10 for the pasture land. In forming that estimate he allowed £5 per acre for drainage, and included, besides draining, trenching or ploughing, clearing, building, and fencing. He also recommended the making of 35 acres of plantation at a cost of £300 on the high side of the farm, the object being to afford shelter and improve the climate.

Operations were commenced on these sections early in March 1877, and were carried out on the lines laid down by Mr Greig. The alteration contemplated in the Sutherland plough was effected, and found thoroughly successful. The aim was to take sand from under the vegetable matter and throw it on to the surface, so that the peaty substance and the sandy subsoil might be mixed together. This object was accomplished most satisfactorily by attaching a huge mould-board to what is known as the "Duke's Toothpick," or the anchor-shaped subsoiler which follows in the furrow behind the main plough. This new application brought a very large additional strain on the engine, and during the summer of 1877 frequent consequent breakages hindered the progress of the work, and also tended to increase the expense. In course of time, however, the adjustments of the plough were made so thoroughly efficient that the share or other part catching on a boulder or any such obstacle involved no risk of breakage, the plough, by its own action, rising and creeping over what resists an ordinary strain. The manager here had a difficulty to contend with in regard to the drainage. As indicated in his report, he was unable to say where drainage might be necessary, until, by the breaking of the surface, the water was allowed access to the subsoil; and, owing to the difficulty in carting material over land newly ploughed to a depth of about 2½ feet, the cost of forming the drains after the land was turned over was greater than it would otherwise have been. These two difficulties, the breakages and drainage, added considerably to the cost of the work; but still it is believed that when the 5000 acres laid off on Auchintoul have been reclaimed, the entire outlay will not much exceed the sum mentioned in Mr Greig's report, and which, it may be remarked, is considerably less than one-half of the average cost at Lairg. It will have been observed that the cost of liming has not been included in Mr Greig's estimate of £20 per acre. English lime can be obtained at Kinbrace railway station, within two miles of the works, at 21s. per ton; but the cost of applying it to land so soft and turned over to such a depth as that at Auchintoul is nearly three times as much as in the case of ordinary arable land. The quantity of lime allowed to each acre is as

nearly as possible 5 tons. Part of it is imported from Northumberland, and part from the Duke's own limeworks at Eriboll. It is believed by most practical men that 5 tons per acre is too much for the first dressing to such land as that in Kildonan, and it is intended to lessen the quantity as experience teaches. The fencing at Kildonan is all of iron, in stone bottoms, and on the Corimony principle, including the Master of Blantyre's patent. The drainage is being accomplished according to the best known methods; and with so many deep beds of moss, great care is frequently to be exercised in order to insure efficiency. In some spots at Auchintoul the drains have been cut to a depth of from 17 to 19 feet; but experience has shown that it is desirable, as far as possible, to avoid land requiring drains of that character. Had they not been necessary for the squaring of fields and farms, these spots would not have been touched in this case.

The "making" of the surface after the land is ploughed (or trenched, as the work of the Sutherland plough may be more properly called) has been found to be a process of great importance in Kildonan, where it is necessary that a little of the subsoil should as far as possible be mixed with the surface or peaty soil. This important work is being most satisfactorily accomplished by a sort of harrow cultivator of novel design, called the "discer," and patented by Mr Greig. Its construction will be indicated afterwards, but it may be stated here that it does its work in a most admirable manner, "tearing into shreds and effectively pulverising sods of a texture tough enough to have withstood the action of the elements for years." The deputation from the Scottish Chamber of Agriculture that visited the reclamations in the autumn of 1878 reported, in regard to the efficiency of the implements employed, that the Duke of Sutherland "must have achieved a triumph far beyond his most sanguine expectations." In respect to the "discer," which is one of the later inventions in connection with the reclamations, it may safely be said that a more efficient instrument for the work it performs can hardly be conceived.

The reclamations at Auchintoul now extend to close on 500 acres, the extended limit laid off for reclamation on that farm; the land having been divided into five sections and worked under eight distinct heads, a separate account being kept for each head—viz., trenching, draining, clearing, fencing, roads, building, liming, and farming. Last spring two fields in Auchintoul were sown with oats and one with turnips, but the bad seasons told seriously against both crops. The turnips looked fresh and healthy, but far from a heavy crop.

At Bannockburn, immediately adjoining Auchintoul, another large reclamation scheme is well advanced, and a great deal more of similar work has been mapped out in this district.

The Bannockburn land is to be "divided into four small farms of 100 acres, each with a large outrun (perhaps 1000 acres), so that a farmer coming there with his family might get along comfortably with a small capital of £500 or £600." About 40 acres have already been reclaimed on each of these small farms, and on the first two handsome steadings and dwelling-houses have just been erected. These buildings are of novel construction, being almost entirely formed of concrete. The office houses are covered with one large span of corrugated iron, supported by girders of worn-out rails, which are obtained cheaply at the railway station, and which suit the purpose admirably. With the exception of this roof, however, and the doors and windows, the whole construction is formed of concrete—walls, floors, stairs, roofs, and even the floors of the attics and granaries, which have no support other than the concrete. The dwelling-house forms one side of the square, with a door from the kitchen to the shed and straw barn, so that the whole may be said to be a huge concrete box, with convenient internal divisions. The stones used were gathered off the new land and run through the steam stone-breaker. The fittings, doors, windows, &c., were constructed at the Duke's own works at Brora, and were put into their places as the building progressed. Excepting that which fell to the plasterer, the whole of the work connected with the buildings was done by unskilled labour; and there is good reason to believe that this system of erecting steadings will remove the difficulty that has hitherto been experienced in building houses for small farms at a cost in keeping with the limited extent of the holding. The exact cost of each of these steadings has not yet been ascertained, but it is believed that, including the dwelling-house, it will not exceed £450.

The Implements used in the Reclamations.

Most of the implements employed in these reclamations were invented for the work they perform, and therefore deserve special notice. The "Sutherland plough" may be taken first. Steam ploughs for ordinary purposes not being suited for trenching new land, His Grace the Duke of Sutherland set about the invention of a steam-driven instrument that would do so, and after seven years' experiments, and an expenditure of money which could have been made only by a nobleman such as the Duke, success has been attained which must be equal to, if not beyond, the most sanguine expectations. The perfection of the present instrument has been reached step by step. The first step was to get the plough to clear boulders, and thus avoid breakage.

This was attained by the introduction of a large revolving disc coulter, set to act slightly below the depth of the share. It will be noticed that this provision will cause the plough, when it strikes a boulder, to rise over it; and this it does in the most efficient manner. The plough so arranged was balanced on four rollers—two for guiding the depth on the land side, and two on the furrow side for the joint purpose of balancing the plough and assisting the mould-board to complete the turning of the furrow. The next object to be attained was to get something in the shape of a hook attached to the plough to pull out the boulder after the plough had passed over it. A large hook, like the claw of an anchor, now well known as the "Duke's Toothpick," was designed and hinged on to the plough at each end; and this addition not only answered the purpose of pulling out the boulder, but acted otherwise as an efficient subsoiler, breaking the "pan," and thus rendering the drainage much more effective. This "toothpick," however, having to be kept in its work by means of leverage from the tail-rope, was the cause of considerable delay in the readjustment of the plough at the end of the furrow for the return bout, and a scheme has been devised by which pressure is now thrown from the one end to the other by a self-acting arrangement of loop-line. Since then another addition has been made to the implement, which is now perhaps the most effective part of it. A large mould-board has been added to the "toothpick," and the stones are not only now loosened, but a great many of them are thrown out, and a large quantity of subsoil, &c., is thrown on the surface of the first furrow, covering and blinding the tough "divoty" surface. The plough is now capable of taking a furrow 20 inches broad, to a depth of from 2 to 3 feet, and under favourable circumstances covers about 3 acres a-day. The cost of the implement is £150.

The next implement used is what is known as the "discer." It consists of a frame, from 15 to 20 feet long, on four wheels, which is the steerage frame. Under the frame are carried, by whipple-trees in the usual way, two or three shafts. These shafts are each mounted with eight to ten sharp cutting discs about 3 feet in diameter. They are set so as to cut at an angle to the line of work, and in this way not only cut and scrape, but turn a furrow. The different sets are also so arranged as to cut at reverse angles, and the soil gets completely pulverised without tearing up any of the tough sods from below. Since these discs never clog and cannot possibly catch hold of stones or other obstruction, they are driven at a high speed, which renders the cultivation much more effective. Previous to the invention of this implement, the greatest possible difficulty was experienced in getting anything like a seed-bed on the tough benty matter which forms the sur-

face of a great part of Sutherland. All sorts of implements were tried, along with many new designs, but with no success, until the "discer" was thought of.

The removal of the stones from the surface of the land proved a difficult task, in as far as it was impossible to get animals to walk on land which had been moved to such a depth. This, however, was most successfully overcome by the construction of a very ingenious steam-sledge, which carries from 4 to 5 tons of stones at a load. This sledge is provided with a pulling lever hung from its centre on both sides. To this lever are fastened the pulling ropes of the two engines. When No. 1 engine has drawn the load to the end of the field where it is desired to be emptied, No. 2 engine starts pulling the lever from a horizontal to a vertical position. At this point it is received by a catch and held, so that in going further it takes the sledge round with it. By this means the sledge is rolled on to its face, catching the ground by two snugs, which cause it again to roll on to its bottom empty. When this is done it has thus made a complete somersault without even the stoppage of the machinery, and returns without further trouble for another load.

Another implement in connexion with the reclamation worthy of notice is the Sutherland water cart. A large quantity of water being required for the engines, and from the fact of its having to be drawn on many occasions from deep ravines from which the ascent was difficult, the ordinary water cart, with the single barrel placed longitudinally on the wheels, was found most unsuitable for the work. It is well known that half a load of water cannot be taken by a cart of this description, from the fact that, in attempting to go up an incline, the water runs to the back end of the barrel, almost lifting the horse from the ground, and this applies to some extent even although the barrel is full. The Sutherland water cart, instead of having one large barrel, has two small ones across the frame, one before the wheel and the other behind. The two barrels are connected by a pipe at their bottoms, and this pipe is fitted with a cock in the centre. It will be seen at once by this arrangement that the cart can be loaded suitably to the ascent. If the gradient is a heavy one, only the front barrel should be filled, so that the water would be partly pulled and partly carried, giving the horse great tractive orce. As soon as the ascent is made, all that has to be done is to turn the cock and allow the half of the water to pass into the second barrel. The cart has been found a most perfect arrangement, allowing the carter to balance his load to the greatest nicety, and to alter on the road from time to time as he may desire. This cart, it is understood, has since been copied by the War Office for military purposes.

The Reclamations Viewed Financially.

The total expenditure up to the present time (October 1879), in connection with these reclamations, amounted to about £130,000, exclusive of the working plant. Of this about £110,000 must be noted against the Lairg improvements, which in reality may be said to have been nothing else than one large experiment. Having failed to obtain contractors to carry out the work there in accordance with the recommendations of Mr Kenneth Murray, the Duke determined to accomplish it by steam power. In his first attempt to do this, he found the steam cultivating tackle, as it then existed, wholly unsuited for such heavy work. It was much too weak, and in other respects unsatisfactory. Steam power, indeed, had never been before applied to such a purpose, and he thus discovered, as it were, that he had undertaken an operation for which no capable instrument had yet been devised. Science had already provided him with suitable motive power in the shape of substantially designed locomotive steam engines, but almost everything else in the form of implements he had to construct for himself. The devising and perfecting of implements to perform most difficult operations so satisfactorily as the Sutherland reclamation implements now do, must have entailed enormous expense. Many weary days and weeks were spent amidst what seemed at times almost hopeless confusion, for, as each fresh difficulty presented itself, some new appliance had to be devised to overcome it. In these circumstances it is only reasonable that a large proportion of the outlay of Lairg should be charged against "experiments," and not on the actual reclamation of the land. In proof of the fairness of this suggestion, it may be stated that, while at Lairg, before the implements were made so thoroughly perfect as they now are, the ploughing cost in some cases as much as £25 per acre, it has latterly been accomplished in Kildonan at about £3 per acre, the soil in the latter case being turned over to a depth of about 30 inches.

Other Works on the Sutherland Property.

Besides these vast reclamations, the Duke of Sutherland has carried out, or has at present in progress, many smaller but important improvements on his extensive northern property. He has expended many thousands of pounds in improving and building houses for smaller tenants or crofters; and has advanced at a moderate rate of interest a still greater sum to the larger farmers for improvements on their farms. Several of the tenants of arable farms have extended their holdings with money advanced by the Duke in this way; while, under like conditions, a number of the larger sheep farmers have reclaimed 100 or

more acres, at suitable parts of their farms, for the purpose of providing turnips and fodder for their sheep in stormy weather, or for bringing up the weaker animals to the level of the flock. To enumerate all the various works on which His Grace has been engaged on his wide northern possessions in recent years, would be no easy matter. Probably no more concise statement could be given than the following, which appeared in "Chambers' Journal," in December 1874:—"Railways in the Highlands at a cost of upwards of £300,000; opening lime quarries and building lime kilns at Lairg and Eriboll; placing a steam barge on Loch Shin for goods traffic; re-opening and working coal mines at Brora; erecting a large brickwork and manufactory of tiles, draining pipes, fire bricks, &c.; reclamation of land on a very large scale, at various places, especially at Lairg, by means of steam ploughs of novel construction and remarkable power; introducing road locomotives and portable thrashing machines; providing steam ploughs for hire; laying oyster beds; breeding salmon on a large scale, and trying the effect of introducing the breed of such rivers as the Tweed, the Tay, and the Thurso into the smaller rivers of Sutherland; gas-making from peat, and testing the value of peat as fuel for domestic purposes, for engines, lime burning, &c.; experiments for improving the quality and durability of home-grown timber; trying the effect of pure water irrigation on lawn and mountain grasses; extensive planting; division of shootings and building lodges, with a view to increasing the number of resident shooting tenants; erection of saw mills and steam carpentry works at Brora, capable of turning out every kind of woodwork necessary for building houses, &c.; workshops at Brora for repairing steam ploughs and machinery of every kind." It would be impossible to guess at the outlay which these numerous important enterprises may have cost, but it is believed that during the eighteen years that have elapsed since he succeeded to the Dukedom, he has expended on such works on his estates in England and Scotland more than half a million sterling. His Grace is gifted with a kind heart, a vigorous mind, and a just sense of the maxim that property has its duties as well as its rights. It is stated by one who knows his habits intimately, that he "has his work chalked out to occupy the hours of every day as it passes, and seems never so happy as when engaged in the ordering or development of some portion of his large trust."

Arable Farming.

General Notes.—It has already been indicated that only a very small proportion of the county is adapted to arable farming. By a liberal estimate, that area is stated at about

one twenty-fifth part of the county, or about 48,300 acres. As will be seen, little more than one-half of that area has been brought under the plough. The following table shows the estimated arable area in the county at various periods since 1808:—

1808,	18,125 acres.	1875,	26,788 acres.
1853,	22,022½ „	1879,	29,441 „
1870,	23,122 „		

Increase since 1808, . . . 11,316 acres.
„ „ 1853, . . . 7,418½ „

The only part of the county in which arable farming in the fulness of its character is carried on, is on an irregular narrow fringe along the south-east coast, not at any point more than 2 miles broad, and in general barely half a mile. On the northern and western coasts there is a considerable area of cultivated land, but it is nearly all in the form of crofts, ranging from 2 to 10 acres in extent. Though even on the south-east coast the arable area is small, yet it exhibits a system of farming quite abreast of the times. The advance that has been made in this respect during the last quarter of a century has been very marked and highly creditable to the Sutherland farmers. The best modern farm implements of all kinds are now in general use in the county. There are a good number of double-furrow ploughs and a good many grain-sowing machines, broad-cast sowers being most in favour. Reapers and mowers are now employed on all farms. One point in connection with the division of Sutherland deserves remark—the almost entire want of what are generally known as middle-class or middle-sized tenants, that usually large class that in most other northern counties links the few large farmers to the many small tenants or crofters. The thirty or forty sheep-farmers who hold the interior of the county, likewise lease and work in connection with their grazing farms the greater part of the arable land, leaving little or no room for the *bona fide* middle-sized arable farmer. The county of Caithness is similar in this respect. The following table indicates what has been said:—

Number of Holdings in 1870:—

Not exceeding 5 acres, ...	1676
From 5 to 20 acres, ...	543
From 20 to 50 acres, ...	53
From 50 to 100 acres, ...	22
Above 100 acres, ...	44
Total, ...	2338

The percentage of holdings under 20 acres in extent is 95; of

farms above 20 and under 100 acres, 3; and of holdings above 100 acres, 2. The total acreage of the 2294 holdings under 100 acres does not exceed 20,000 acres, so that the 44 upwards of 100 acres have amongst them over 1,187,000 acres, or an average of close on 27,000 acres each. Had the returns gone further it would, in all probability, have been seen that about thirty tenants hold among them more than nine-tenths of the whole area of the county, or an average of over 36,000 acres each. Sutherland stands fourteenth in Scotland in regard to the total number of holdings, fifth in regard to the number of crofters, twelfth in regard to holdings between 5 and 20 acres in extent, twenty-ninth with holdings between 20 and 50 acres, equal with Kinross for the thirtieth place as regards holdings between 50 and 100 acres, and thirty-second with holdings over 100 acres in extent.

In the parish of Creich, which has a total valuation of close on £11,000, there are several good arable farms. The largest proprietor in this parish, or rather the proprietor having the largest rent-roll, is Mr Evan Charles Sutherland-Walker of Skibo, whose rental in Creich in 1878–79 was £2795 (an increase of £701 since 1874–75), and who also ranks in the adjoining parish of Dornoch for £1437 of annual rent. Mr Sutherland-Walker purchased the Skibo estate in 1872 at £130,000. At that time the property was in a somewhat neglected condition, and the present proprietor has expended more than it has yielded by bringing it into thoroughly good order. He has erected several new buildings, constructed new roads, and erected a large stretch of wire fencing with iron strainers and larch posts. Formerly the tenants were allowed to crop as they pleased (if they did not take two grain crops in succession) up till within five years of the expiry of their leases, when they were bound to farm in a five-course shift; but Mr Sutherland-Walker has, in his new leases, turned them all into the five-shift rotation. The general character of the farming on this estate has improved considerably during recent years, the exertions of the present proprietor having been admirably backed up by the tenants, who have worked hard to improve the condition of their land and houses. The rental of the arable land over the Skibo estate is on an average about 20s. per acre, the soil being generally light sandy loam. On this estate there are about a dozen tenants paying over £50 of rent, and about 150 crofters paying under £20 each. The farms are all well supplied with servants' cottages. One of the largest farms on the Skibo estate is Overskibo, in the parish of Dornoch, extending to 175 acres arable and 80 acres of heath, rented at £210, and tenanted by Mr George Forbes. The soil on the most of this farm is black loam, but in part of it there is stiff clay. Barley yields from 4½ to 5 qrs. per acre, and weighs

about 54 lbs. per bushel; oats, about 3½ qrs. per acre, and weighs from 41½ lbs. to 42 lbs. per bushel. In a favourable year sowing commences soon after the middle of March, and the harvesting commences about the second week of September. About 80 acres are worked by each pair of horses. There is no accommodation on the farm for feeding cattle, and part of the turnip crop is always eaten off by sheep. Part of it is sometimes let for that purpose, and usually brings from £7, 10s. to £8 per acre. Turnips and potatoes grow well, being liberally manured, about 25 loads of farmyard manure with 4 cwts. of dissolved bones per acre being allowed. The farm has recently been thoroughly re-drained and limed by the tenant, while new fences have also been erected. Mr Forbes also rents grazing land, which carries from 1100 to 1200 sheep, one "hirsel" being Cheviots and the other Black-faced sheep. The Duke of Sutherland has a rental of £1893 in Creich; and the other larger proprietors and their rentals are—Sir Charles W. A. Ross, Bart. of Balnagown, £1854; Mr Dugald Gilchrist of Ospisdale, £823; Mr R. Tennant of Rosehall, £583; Mr Sidney Hadwen of Balblair, £514; representatives of Mr Charles Stewart of Dalerombie, £425; Mr Charles E. Flower of Glencasley, £310; Professor Geddes and Mrs Geddes (Aberdeen) of Invernauld, £272; and Mr John R. Tennant, younger of Rosehall, £227. The Duke of Sutherland's rental in the parish of Creich has fallen by £7 since 1874–75, while that of Sir Charles Ross has advanced by £318. The gross increase in the parish during the past four years is £1431.

The Duke of Sutherland draws nearly three-fourths of the rental of the parish of Dornoch, which now amounts to £6928, and which has increased by £750 since 1874. There are some very good arable farms on His Grace's property in this parish. The farm of Embo Mains, occupied by Mr William Gordon, extends to 457 acres, and is rented at £456. Worked on the five-shift rotation, its soil inland is clayey, sandy near the coast, and black loam in the centre. The crops grown are barley, oats, turnips, potatoes, rye, tares, and hay. Barley yields about 4 quarters per acre, and weighs from 53½ lbs. to 54 lbs. per bushel; oats and rye give a similar return, and weigh respectively about 42 lbs. and 58 lbs. per bushel. Sowing commences usually about the middle of March, and harvesting about the middle of September. Each pair of horses on this farm works about 90 acres. Mr Gordon keeps a good stock of cross and Highland cattle, selling off a number of fat cattle in the spring, when they weigh from 6 to 8 cwt. dead weight. Green crops grow well, and get from 5 to 6 cwt. of dissolved bones and guano per acre, along with a liberal supply of farmyard manure. About 140 acres were recently reclaimed on this farm, and are yielding good crops. Mr Gordon also holds the arable farm of

East Brora and the grazing farm of Grumbie, which is stocked with Cheviot sheep. The farms of Torboll and Coul are carefully managed by Mr George M. Ross, the one being rented at £455 and the other at £290. Both these farms are worked on the five-shift rotation, and give about 3½ to 4 qrs. of barley and oats per acre; the former weighing from 52 lbs. to 56 lbs. per bushel, and the latter from 40 lbs. to 42 lbs. Turnips, which yield well, are usually allowed from 16 to 20 loads of farmyard manure per acre, along with from 5 to 7 cwt. of artificial manure. All the fences (dykes principally) have been renewed on these farms within the last two years; the proprietor erecting the dykes and the tenant driving the materials. Mr Ross also holds grazing land stocked with a ewe stock of Cheviots, and he consumes most of his turnips with his own sheep. The parish of Golspie may perhaps be said to be the best agricultural district in the county. Since 1874 its valuation has increased from £5343 to £6179, of which £5136 are drawn by the Duke of Sutherland. His Grace has two farms in the parish in his own hands,—Dunrobin Mains and Rhives. The Mains extends to 650 acres, of which 240 acres are farmed on the five-shift rotation. The soil is good, chiefly loam and admixture of clay. It is farmed on the most advanced principles by Mr John Blake, His Grace's experienced manager, and yields excellent crops of barley, oats, and turnips. Barley yields about 5 qrs. per acre, and weighs on an average 54 lbs. per bushel; and oats about 6 qrs., and weighs 42 lbs. The other 410 acres lie out in permanent pasture, and afford a most luxuriant supply of grass. This land is divided into fields of different size, and is well fenced. About 600 Cheviot sheep are kept, and depend entirely on grass. Two-thirds of the ewes nurse twin-lambs, and the wethers at two years old average 21 lbs. per quarter. Rhives extends to 120 acres. It is a drier loam, and yields heavier grain by 1 lb. to 2 lbs. per bushel than Dunrobin Mains. At the latter farm a fine herd of West Highland cattle is kept, including about forty cows; and in addition to these it carries thirty cross cows. The young stock are usually sold fat at high prices when about two years old. From these two farms His Grace usually sends some excellent animals to the principal English and Scotch fat stock shows. The farm of Culmaily, occupied by Mr P. P. Sellar, and rented at £746, is well situated near Golspie. This farm, as already stated, was leased by Mr Patrick Sellar, father of the present tenant, about 1809, and by him the greater part of it was reclaimed. It now extends to about 400 acres, beautifully laid off in sixteen fields, and all fenced with dykes. The greater part consists of a black loamy soil, there being some spots of moss and some of clay. The subsoil all through is of a sandy nature. Worked on the

five-shift rotation, and most liberally manured, the farm yields most excellent crops of oats, usually 5 qrs. per acre, weighing 42 lbs. to 44 lbs. per bushel. Barley does not turn out so satisfactorily, seldom reaching 4 qrs. per acre and 54 lbs. per bushel. A little wheat is usually sown after potatoes and grows well, yielding from 3 to 5 qrs. per acre. A small field of potatoes has been tried in the last few years, and they have given a very fair return, sometimes 30 bolls per acre. A commodious, convenient, and substantial steading was built about twenty years ago, and increased shedding accommodation for cattle has been recently erected. From 120 to 150 Caithness-bred cattle are fed off annually at three years old; one-half of the turnip crop going to them, and the other half being consumed on the land by feeding sheep. The adjoining farm of Kirkton, rented by Mrs Murray at £368, is worked in a similar manner, and yields fair crops. There are several other very desirable smaller arable farms in this parish, mostly all carefully and liberally farmed.

In the Brora district, in the parish of Clyne, there is a considerable extent of arable land, held chiefly in small holdings. Along with Clynelish Distillery, Mr George Lawson holds a well laid-off liberally-managed farm of 285 acres. It has, till recently, been all regularly worked on the five-shift rotation, but the most of it is now being laid down in pasture; while, with the view of avoiding "finger and toe," the turnips are being grown after grass. As yet the experiment has been most successful, and excellent crops are raised. A number of Aberdeen and Angus polled cattle were introduced by Mr Lawson a few years ago, and they are doing exceedingly well. The steading on this farm has few equals in the north of Scotland. One of the finest arable farms in the county is Crakaig, in the parish of Loth, and rented along with Lothbeg by Mr John B. Dudgeon at £712, 10s. As previously stated, part of Crakaig was reclaimed many years ago from a sort of lake; and, consisting as it mostly does of rich loamy clay, and being liberally treated, it produces heavy crops of wheat and oats, and a fair yield of barley. Potatoes and turnips also grow well. There is a good steading on this farm, and Mr Dudgeon feeds a good many cattle, chiefly Caithness crosses or crosses of his own rearing. The newly-reclaimed farms at Lairg have already been noticed. It is perhaps not desirable to occupy space by referring to more individual arable holdings.

Leases, Rent, and Rotation.

Leases.—There is little variety in the duration of leases in this county, nineteen years being the general term. All farmers

and a few crofters possess leases for nineteen years or a shorter period, but the greater mass of the latter are merely tenants-at-will, with yearly possession from Whitsunday to Whitsunday, the rent being payable in advance at Martinmas.

Rent.—The rate of rent paid for the arable land varies considerably. The lowest is about 10s., the highest about 35s., and the average probably 20s., or a little over that, per acre. The increase during the past twenty-five years is equal to about 30 per cent. The crofters pay from 15s. to 20s. per acre, including outrun, which on an average carries for each a pony, a cow, a quey or stirk, and ten sheep. If the crofters have no pony, two cows are usually allowed. The ancient system of paying rent in kind and by service has long since vanished from the county, and its demise need not be regretted.

Rotation of Cropping.—There is perhaps no county in Scotland in which there is so little variety in the system or rotation of cropping pursued as in Sutherland. With a few solitary exceptions, the five-shift rotation prevails everywhere—*first*, turnips and potatoes; *second*, barley (sometimes wheat and barley); *third*, hay and grass; *fourth*, grass; *fifth*, oats. The arable farming of the county may be said to be entirely subservient to its more extensive pastoral system. Therefore the five-shift system is pursued, mainly because it affords the greatest possible breadth of grass and turnips, which are indispensable for Cheviot sheep-farming in the north of Scotland. This rotation of cropping is in no respect too severe for moderately heavy land where a good deal of feeding takes place, and where, consequently, the substance withdrawn from the soil by the crops is returned to it in the form of farmyard manure. The soil of Sutherland, however, is on the light side for so rapid a course of cropping; and, as little cake or other nutritious food is consumed along with the grass and turnips, the farmers must necessarily purchase a considerable quantity of artificial manures in order to maintain the fertility of their land.

Grain Crops.

The following table shows the number of acres under all kinds of grain crops in various years since 1853:—

1853, .	10,529 acres.	1875, .	9,743 acres.
1870, .	8,644 „	1879, .	10,235 „

Decrease since 1853, . . 294 acres.

The returns collected by the Highland and Agricultural Society were exceptionally full and accurate. On the whole,

the area under grain crops has slightly decreased during the past quarter of a century. The increase of 7419 acres in the arable area in that period, as will be afterwards shown, appears now as almost wholly under grasses. The percentage of corn crops to the arable area in 1870 was 37·4, which placed Sutherland, in that respect, eleventh among the Scotch counties. In regard to the total area under grain crops, Sutherland comes twenty-seventh. Sutherland does not contribute to the meal supply of the large centres of population; indeed, in that matter it is far from self-supporting. The cultivation of the grain crops is pursued on principles similar to what prevail in the most advanced districts of the country; and, considering the situation of the county, grain of a very fine quality is produced. Sowing commences, in a favourable year, towards the end of March; harvesting operations are begun from the middle of August till the second week in September.

Wheat.—As already stated, wheat was tried in the county many years ago, and soon given up owing to the distance from the southern markets and the supposed unsuitability of the climate. Its cultivation, however, has not been long entirely abandoned, for in the returns collected by the Highland and Agricultural Society in 1853, 217½ acres were in that year under wheat. The following table shows the number of acres under wheat at various times since that date:—

1853,	217½ acres.	1875,	114 acres.
1870,	246 „	1879,	27 „

Decrease since 1853, . . 190½ acres.

It will thus be seen that wheat has latterly been declining in favour. It is now grown on only two or three of the better farms, such as Culmaily and Crakaig. On the former it yields from 3 to 5 qrs. per acre, and in a good year the sample is of very fair quality and colour. In such a wet season as this (1879) has been, however, it would not turn out a paying crop. About 3 bushels of seed is allowed per acre. Sutherland stands twenty-sixth among the other Scotch counties in regard to the area under wheat.

Barley.—This variety of grain grows well in the county, and is cultivated in considerable breadth. The following table shows the area under barley at various dates since 1853:—

1853,	3643½ acres.	1875,	2286 acres.
1870,	2060 „	1879,	2268 „

Decrease since 1853, . . 1375½ acres.

It will thus be seen that barley has not increased since 1853,

but that it is more largely grown now than a few years ago. The yield of barley ranges from $3\frac{1}{2}$ to 6 qrs. per acre, the average being, perhaps, between $4\frac{1}{2}$ and 5 qrs. The weight varies from 50 lbs. to 54 lbs. per bushel, the greater portion being close on the latter weight. Barley is grown always after green crop, and about 3 bushels of seed are allowed to the acre. A good deal of the barley grown in the county is manufactured at the celebrated Clynelish Distillery. In regard to the area under barley Sutherland comes twenty-second in Scotland.

Oats.—As might be expected, and as shown by the following table, oats are the most popular variety of grain :—

1853,	6569½ acres.	1875,	7191 acres.
1870,	6181 „	1879,	7809 „
Increase since 1853,			1839½ acres.

The soil and climate of Sutherland are admirably adapted to the cultivation of oats. In general, the yield is large and the quality of the grain good. The yield varies from $3\frac{1}{2}$ to $6\frac{1}{2}$ qrs. per acre, the average being slightly over 5 qrs; while the weight ranges from 40 lbs. to 44 lbs. per bushel, 42 lbs. being about the average. Sandy oats are largely used; but, latterly, such varieties as longfellow, and finefellow, and potato oats have been sown to a considerable extent. Swiss and Canadian oats have been found to suit the new land at Lairg exceedingly well. The former have given a yield of from 4 to 6 qrs. per acre, and weighed about $38\frac{1}{2}$ lbs. per bushel, while the latter afford a fair return, and weigh about 44 lbs. per bushel. From 4 to 5 bushels of seed are given to the acre. A considerable quantity of the yield of oats is appropriated as food for horses, and also some for cattle and sheep; but the larger proportion is made into meal for the inhabitants. In regard to the area under oats Sutherland stands twenty-eighth among the Scotch counties.

Rye and Peas.—These are not cultivated to a very great extent; while it is one of the few Scotch counties that grow no beans. The area under rye in 1853 was $7\frac{3}{4}$ acres, and this year (1879) 87 acres. The yield averages about 4 qrs. per acre, and the weight about 58 lbs. per bushel. In 1853 there were $90\frac{3}{4}$ acres under peas, and this year 44 acres.

Hay and Grass.

In a county where the rearing of stock rules so supremely as in Sutherland, the pasture break is one of the most important on the farm. It is therefore natural that the increase of 7419 acres in the arable area since 1853 should have been added chiefly to the land under pasture. The following tables show that it has been so appropriated :—

Grasses under Rotation.

1853,	4977 acres.	1879,	7617 acres.
1870,	5887 „	1875,	6184 „

Increase since 1853, . . 2640 acres.

Permanent Pasture (exclusive of Heath or Mountain Land).

1853,	1817¾ acres.	1875,	5457 acres.
1870,	4198 „	1879,	6102 „

Increase since 1853, . . 4284¼ acres.

It will thus be seen that these two heads absorb 6923½ acres of the increase, leaving only 495½ acres among all the other crops. The pasture not under regular rotation has by far the largest increase, and in these depressed times it is likely enough that in Sutherland, as in most of the other northern counties, the increase in that direction will go a good deal farther. The demand for hay as winter food for sheep is great, and therefore a considerable breadth is assigned to that crop every year. When sown out for hay and grass after green crops, the land receives about 30 lbs. of rye grass and 10 lbs. of mixed clovers per acre. A little more of both varieties is given when the land is meant to lie for several years under grass.

Green Crops.

Turnips.—The following table shows the area under turnips at various dates since 1853:—

1853,	2090¾ acres.	1875,	2964 acres.
1870,	2506 „	1879,	3232 „

Increase since 1853, . . 1141¼ acres.

It will be observed that turnips come next to grass under rotation in the rate of increase during the past quarter of a century, and appropriate more than the decrease in both grain crops and potatoes. It has already been shown that turnips play a very important part in the economy of Sutherland; and therefore, as much of the arable land as possible is devoted to them. In some cases their cultivation has been interfered with by that perplexing disease, "finger and toe," which is no doubt, to a certain extent, fostered by the five-shift rotation. As previously stated, Mr Lawson, Clynelish, has commenced growing them after lea, which has proved as yet a complete preventive of the disease. On new land, on the farm of Melness, on the north coast, the *fungus*, or whatever it is, attacked the roots so persistently that their cultivation had to be abandoned. Turnips, nevertheless, grow exceedingly well in the county, and

the yield is fully equal to the average in the other northern counties. Swedes and yellows are the varieties most widely sown. The quantity of seed allowed to the acre is about 3 lbs. of Swedes and $2\frac{1}{2}$ lbs. of other varieties. Generally speaking, the land intended for turnips is manured with from sixteen to twenty-five loads of farmyard dung, and from 3 to 8 cwt. of artificial manure, chiefly dissolved bones and guano. The greater portion of the turnip crop is consumed on the land by sheep, and when let for that purpose brings from £6 to £9 per acre. Sutherland stands twenty-sixth among the Scotch counties in regard to the area under turnips.

Potatoes.—The following table indicates the area under potatoes since 1853:—

1853 . . .	$2506\frac{3}{4}$ acres	1875 . .	2008 acres
1870 . . .	1748 „	1879 . . .	1929 „

Decrease since 1853, . . $577\frac{3}{4}$ acres.

Excepting on a very few farms on the south-east coast, this esculent is grown solely for home consumption, a great proportion of the crop being grown by the small tenants or crofters, among whom potatoes form a very important article of food. The average yield over the county is about 15 bolls per acre, and the quality is usually good. During later years a few farmers on the south-east coast have tried small fields of potatoes, and the result has been encouraging. Mr Sellar has sometimes a yield of 30 bolls per acre, including all sizes.

Other Green Crops.

Some years a few acres are sown with rape, chiefly new land. This year there were 19 acres under that crop, and in 1878, 222 acres. Of vetches there were 46 acres this year, and 39 last year. This year there was 1 acre under mangold, but the climate is too cold for that root. It is seldom that much land is allowed to lie in fallow. This year there were 260 acres, and 75 acres last year.

Live Stock.

Horses.—The number of horses in the county at various dates is shown by the fellowing table:—

1853 . . .	2794 horses	1875 . . .	2526 horses
1870 . . .	2511 „	1879 . . .	2629 „

Decrease since 1853, . . 165.

Of the number of horses returned this year, 2105 are used solely for agricultural purposes, the remaining 524 being kept

either for breeding purposes, or are young unbroken animals. The number used solely for agricultural purposes has increased by 40. The farm horses generally throughout Sutherland are not heavy, but are of moderate size, very active and durable. They go smartly with fair loads, and are well-suited for cultivation work. On the better farms they are mostly of the Clydesdale stamp, and throughout the county generally they have been much improved recently by the introduction from the south of good draught stallions. The Duke of Sutherland at one time kept entire horses of the most suitable description, both for road and farm, and many good horses were reared from these. The Master of Blantyre has introduced two excellent stallions on his new farms at Lairg, and their progeny will no doubt effect still further improvement in that neighbourhood. At the local ploughing matches, where from 40 to 50 pairs of horses turn out well-groomed and well-harnessed, the display is indeed highly creditable to the county. The extent of arable land attached to each pair of horses ranges from 50 to 90 acres. Among the crofters there is a useful small-sized class of ponies that suit the work on crofts admirably.

Cattle.—The number of cattle was, in

1853 . . .	12,592 cattle	1875 . . .	13,198 cattle
1870 . . .	10,367 „	1879 . . .	12,343 „

Decrease since 1853, . . 249

It will thus be seen that the cattle stock of the county has not changed much in numbers during the past quarter of a century. These figures also show that the rearing of cattle is not prosecuted very largely in Sutherland. Indeed, the county stands only twenty-fourth among the other Scotch counties in regard to the number of its cattle stock. There is great variety among the cattle of the district. The ancient black cattle that at one time grazed in the straths in such large numbers have disappeared, and have been succeeded by a mixture of West Highland cattle, polled cattle, shorthorns, and crosses. Of the pure breeds the former predominates greatly, and originally the most of these hailed from Argyleshire and from Skye. In 1865 the Duke of Sutherland had the distinguished honour of carrying away the gold medal and £100 prize for the best fat animal in the Great Smithfield Christmas Show, the only occasion on which that highly coveted honour has been won by an animal of the West Highland breed. The crofters, as a rule, have cows of the Highland breed, and, in most cases, they mate these with Highland bulls, sent throughout his property by the Duke of Sutherland for the use of his tenantry. In this way His Grace sends out, on application through the factors of the various districts,

more than twenty bulls every spring, and takes them back to the Home Farm to be wintered. From these bulls the crofters' cattle (indeed the cattle of the county generally) have been much improved, and the comfort of the smaller tenants greatly enhanced. On the south-east coast shorthorn bulls, chiefly from Morayshire, have been in general use during the last twenty years, and consequently a large proportion of the cattle stock in these parts consists of crosses from Highland cows and shorthorn bulls. A few years ago many of the crofters, finding that cross calves brought a readier sale and higher prices than Highland calves, became anxious to have their cows mated with shorthorn bulls. Crosses, however, do not suit the climate and treatment the cattle of Sutherland crofters have to endure so well as Highlanders, and most of them have gone back to the use of bulls of the shaggier and hardier breed. About six years ago Mr Kelly founded a herd of Highland cattle at Achinduich, and it now numbers about 20 head. The foundation of this promising young herd was laid from a Dunrobin heifer, and a cow from the island of Barra, nearly related to the Highland ox from Dunrobin that achieved the distinguished triumph in 1865. There is very little cattle-feeding in the county, the large majority of the surplus stock being sent south in lean condition when a year and a half or two years old. A few of the larger farmers on the south-east coast,—notably Mr Sellar, Culmaily; Mr Lawson, Clynelish; and Mr Dudgeon, Crakaig,—feed a number of two and three-year old crosses every year, and send them to the southern markets, where they invariably command the top prices. Mr Sellar feeds from 120 to 200 head, chiefly three-year olds bought in Caithness and taken to Culmaily when about two and a half years old. They are commenced in the house there with tares or similar green food, and are afterwards fed mainly on turnips, cake, and grain. They are generally sent to the market about the Christmas season. As already stated, Mr Lawson recently established, at Clynelish, a herd of polled cattle. He acquired good blood at the outset, having been a large purchaser at the dispersion, three years ago, of the herd of the late Mr Paterson, Mulben, Boharm. The animals have thriven remarkably well, and have amply proved the wisdom of introducing them. Mr Lawson feeds the black steers he breeds himself along with a number of bought-in crosses, and for both he obtains the highest current prices, the blacks finding the most favour among the butchers. There is little doubt that the black polled breed would suit Sutherland admirably; and it will be surprising if they are not reared in large numbers in the county before many years have passed. Mr Dudgeon feeds an excellent lot of crosses, partly bred by himself and partly in Caithness. Several of the other farmers along the south-east coast feed a smaller number, mostly crosses

of their own breeding. They send them off when about two years old. Sutherland crosses, at that age, usually weigh from 6 cwt. to 7 cwt. in the carcass. It is worthy of mention that about fifty years ago Mr Alexander Craig, tenant of the farm of Kirkton in the parish of Golspie, kept there an excellent herd of polled Galloway cattle. At the first Show of the Highland and Agricultural Society at Inverness in 1831, Mr Craig won all the prizes offered for Galloway cattle, except one which the Duke of Gordon obtained for a bull. In Mr Ramsay's admirable "History of the Highland and Agricultural Society," there is the following reference to the creditable position taken at that Show by Mr Craig:—"In the Galloway breed, prizes were offered for bull, cow, heifer, and ox. There was a pretty fair muster of the breed, but the exhibitors were not numerous; in fact, there were only three exhibitors—James Bain, Antfield, Inverness, who exhibited a bull; the Duke of Gordon, who exhibited a bull and an ox; the other and chief exhibitor being Alexander Craig, Kirkton, Sutherland, who exhibited two bulls, and who sent all the animals—five in number—entered for the cow premium, and the three animals entered for the heifer premium, together with five animals entered for the ox premium. Mr Craig's cattle were all bred by himself except one of the cows which was bred by the Duke of Gordon. The prizes all went to Mr Craig, except that for the bull, which was won by the Duke of Gordon with an animal bred at Gordon Castle."

Swine and Poultry.—The number of swine in the county was, in—

1853, . . .	1310	1875, . . .	1257
1870, . . .	1378	1879, . . .	1157

Decrease since 1853, . . 153

The stock of pigs in the county has been greatly improved during recent years by the introduction of good sires, but still they are not as a rule of a high class. A large number of somewhat inferior pigs are kept among the crofters.

Poultry are not kept extensively in the county, though there are a few good "stocks" of them on the south-east coast.

Buildings, Fences, and Roads.

Generally speaking, the farms of Sutherland are now well provided with both dwelling-houses and steadings. The improvement effected in buildings during the past quarter of a century has been very great. The Duke of Sutherland has expended a very large sum in that work, the new houses having in most cases been erected at his cost, the tenant paying interest or an equivalent increase in rent. On most of the larger farms the

dwelling-houses are very commodious, and the Duke has erected a number of large and attractive shooting lodges. On most of the larger sheep-farms there are excellent dwelling-houses, in which the tenants reside during the greater part of the year. The dwelling-houses of the smaller tenants and cotters have been greatly improved during the last twenty-five years, mostly by the Duke of Sutherland. They are now, in general, comfortable though not large. The arable farms are all provided with good threshing-mills, driven by water or horses. There are very few covered courts in the county, but they are now to be found on some of the larger farms on the south-east coast, one of the best being at Culmaily. Mr Lawson's steading at Clynelish is worthy of special mention. It was built by the Duke in 1871, the tenant paying interest. It is neat, compact, and exceedingly convenient. The cattleman, for instance, has not to go outside in any of his operations, while for the manure there is a conveniently situated covered pit. The cattle divisions are commodious and well-ventilated. It is, indeed, one of the most compact farm-steadings in the north of Scotland. Mr Sellar has also an exceptionally good steading at Culmaily.

The arable farms are in general well fenced, mostly with dykes and wire. The dykes are usually built at the cost of the Duke, while the tenants drive the materials.

The roads throughout the county are very good. Their formation has already been referred to.

Sheep-Farming.

The wealth and greatness of Sutherland may be said to consist in its sheep-farming. To that important and generally lucrative industry, the arable farming of the county is in a manner made subservient. From it the Duke of Sutherland and the other proprietors derive the larger proportion of their rentals. To it the county is mainly indebted for the prominent part it plays in the agriculture of Scotland. Carried on very extensively, and with much success, the system is distinguished by a perfection of management not excelled in any part of the country. The stock of sheep, too, almost entirely of the Cheviot breed, is of a high class, bearing an excellent reputation, and commanding the top prices in all the leading British markets.

This extensive and improved system of sheep-farming was founded in Sutherland in 1806. In that year, and in 1807, as if to make way for a new order of things, scab and rot killed the majority of the small ill-shaped, ill-managed Kerry sheep that formerly grazed the straths and mountains along with the black cattle. In that year, also, Messrs Atkinson and Marshall arrived in the county from Northumberland, and brought with

them an excellent stock of Cheviot sheep. For these gentlemen a very large grazing farm was formed. It extended from the village of Lairg to the lower point of Lochmaver in one direction, and in another from the river Tirry to the sources of the waters which fall into the Brora and Helmsdale rivers. It consisted of the highest districts of the Sutherland estate, and included Ben Clebrich and Ben Ormin. Of this extensive farm a lease of nineteen years was granted to Messrs Atkinson and Marshall in 1809. A few years thereafter the farm of Achinduich, lower down the Shin, and Letterbeg in Strathnaver, were added to it for the purpose of supplying wintering for the sheep. These united holdings extended in all to about 100,000 acres, so that the pioneer sheep-farmers, as these two gentlemen may be called, had ample room to develop their experience. It is stated by Mr Patrick Sellar, in a letter dated 1820, to Mr Loch, that during the first ten years of their occupancy, Messrs Atkinson and Marshall "had embarked not less than £20,000 in putting breeding flocks on the mountains of Sutherland." The success which attended the undertaking of these gentlemen speedily spread the popularity of the Cheviots all over the county. It induced those tenants who had stocked their farms a few years previously with blackfaced sheep to send away these and adopt the newly imported breed. It also encouraged the formation of more sheep-farms, and the removal, for that purpose, of those small tenants who occupied some of the richest straths in the county. In the course of a few years Cheviot sheep became in a manner the watchwords of those interested in the development of Sutherland, and every encouragement was given to sheep-farmers from the south to settle in the county. The farm of Invershin was let to Messrs Culley and Morton, also from Northumberland, soon after Messrs Atkinson and Marshall came north. Along with Invershin, these gentlemen also held extensive sheep-farms from Sir Charles Ross of Balnagown, whose predecessor, Sir John Lockhart Ross, was the first to introduce the modern system of sheep-farming into the north of Scotland. About the same time a Mr Dunlop, from Ayrshire, leased a large sheep-walk from Lord Reay in Durness, and stocked it with Cheviots, which, even at the outset, throve well. Sir John Sinclair had introduced Cheviot sheep into Caithness about 1790, and, some twenty years afterwards, Mr Innes, a native of that county, took Sandside, in the parish of Reay, and stocked it with Cheviots. Most of his sheep were brought north by Mr John Paterson, whose representatives are now at Armadale. Some time previous to 1812 a company of Roxburgh gentlemen entered on a lease of Armadale, and covered it with a fine stock of Cheviots. Mr Gabriel Reed, from Northumberland, was entrusted with the management of the affairs of the

company, and so well satisfied was that experienced gentleman with the suitability of the county to the Cheviots that, in 1812, he was induced to embark with the large farm of Kilcolmkill, on which he placed a fine stock of about 10,000 head. About the same time Mr Thomas Houston, Mr Patrick Sellar, Major Clunes, and other gentlemen, leased sheep-walks in the county, and adopted the popular breed. Every year swelled the ranks of the Sutherland sheep-farmers, and added thousands to the thriving stock of Cheviots. So fast, indeed, was the growth of the new system, that by 1820 it had spread to all corners of the county, sweeping away all traces of the more ancient order of things that preceded it. It was estimated that the Cheviot stock in Sutherland in 1820 numbered no less than 118,400.

The pioneers of the industry, however, had many difficulties to contend with, which the sheep-farmers in the county at the present day know little of, except through history and tradition. One of the most perplexing of these difficulties was the prejudice, even hostility, of the natives, who made frequent raids on the flocks of the newly settled farmers. To protect their property from being thus plundered, eleven of the larger sheep-farmers in Sutherland and Caithness formed themselves into what was called "The United Association of the Noblemen and Gentlemen in Sutherland and Caithness for the Protection of Property." In 1815, these eleven farmers lost, they believed, through these raids, 1591 sheep, 1596 in 1816–17, while in the next two years the loss was "beat down" to 853 and 794 respectively. As indicating by whom the leading sheep-farms in Sutherland were occupied in the early days of the industry in the county, the list of the members of the association in 1819 will be read with interest. It was as follows:—Messrs Atkinson and Marshall, Lairg, &c.; Major Clunes, Crakaig; Mr Charles Clarke, Glendow; Mr John Clarke, Eriboll; Mr John Dunlop, Balnakiel; Major Donald Forbes, Melness; Major Gilchrist, Ospisdale and Shiness; Mr James Hall, Sciberscross; Mr Thomas Houston, Ribigill and Knockfin; Mr William Innes, Sandside; Messrs Morton and Culley, Invercasley, &c.; Captain K. Mackay, Torboll; Mr A. Mackenzie, Stonechruby; Mr Mackay, Keoldale; Messrs Munro and Reed, Badnabay; Mr John Paterson, Skelpick; Mr Gabriel Reed, Kilcolmkill; Mr Robson, Kirktown; Mr Pat. Sellar, Morvich, &c.; and Captain W. Scobie, Ardvare. Before leaving these bygone times, it may be stated that Mr Patrick Sellar introduced a number of pure bred Merino sheep, and tried them for a few years on the Sutherland hills. It is stated that he reared up his flock of Merinos from 200 to 600 head, of as fine sheep of the kind and as thriving too, as ever stepped on hill ground. But he was induced to give them up. He says, that as three-fourths of the wastes of

Sutherland consist of Alpine plants, which the Merino sheep dislike, "the same quantity of Sutherland ground will keep 300 Cheviots that will maintain 100 Merinos, and that with one-half the care, and one-third part of the risk in winter."

It has been seen that by 1820 the Cheviot breed had a powerful hold in Sutherland. They continued gradually to strengthen that hold until they had, by 1830 or 1835, appropriated to themselves almost the whole of the grazing regions of the county. The following table shows the number of sheep in Sutherland in various years since 1808:—

	One Year Old and upwards.	Under One Year Old.	Total.
1808, . .	—	—	94,570
1820, . .	—	—	130,700
1853, . .	—	—	168,170
1870, . .	163,023	53,538	216,561
1875, . .	178,864	61,232	240,096
1879, . .	168,893	40,520	209,413

Increase since 1808, . . .	114,843
„ 1820, . . .	78,713
„ 1853, . . .	41,243
Decrease since 1875, . . .	30,683

The number returned last year was 234,586, or 25,173 more than were estimated to be in the county when this year's returns were collected. Last winter (1878–79) is regarded generally as perhaps the most disastrous in the present century to Sutherland sheep-farmers. The county lay bound up in snow for nearly four months, and so thick and close was the covering all over, that even the stronger sheep could not, except in some parts, make their way to the heath and grasses. In addition to entailing an enormous outlay for hand-feeding with hay and other material, the stormy winter caused unprecedented losses by death among both old sheep and lambs. If not entirely, there is no doubt that the decrease since last year must be mainly attributed to deaths caused by the severe winter. Compared with last year, the Board of Trade Returns show a deficiency in the crop of lambs of about one-third, or 21,539 head, which is due almost wholly to the stormy weather in winter and spring. All private estimates represent the loss among lambs as considerably greater than one-third; and there is too good reason to believe that it has really turned out to be so. By competent authorities it is estimated that between the marking of the lambs in spring and their weaning in July and August, over 1500 lambs had died in the county; so that the year's crop of lambs in Sutherland would number only about 38,000. Taking the deficiency caused in the crop of lambs by the exceptionally severe winter and spring at 21,539, there

would thus appear from the Returns to have been a loss among the older sheep of only 3634. In reality, however, it was at least four times that number, perhaps not under 15,000.

General Notes on Sheep Grazings.

Before indicating the general system of management pursued, a few hurried notes may be given regarding some of the larger individual holdings. To save repetition it may be stated here, in a word, that the sheep stock of the county consists almost exclusively of Cheviots. Where other breeds are kept, they will be specified. The Duke of Sutherland is himself an extensive sheep-farmer. As already stated, he holds the farm of Shiness, which carries an excellent stock of 2000 sheep, and is assessed on £500. At Whitsunday last he took over from the representatives of the late Mr Bateson the small farm of Cambusmore, which carries about 500 head, and has 95 acres of arable land attached. From Captain Houston His Grace took over the large farm of Kinbrace, extending to about 30,000 acres, when the land reclamations commenced. It is rented at £990, and formerly carried about 5000 head. The Shiness wethers brought 44s. this year, and the cast ewes 31s. The Hon. the Master of Blantyre, the Duke of Sutherland's nephew, is now one of the most extensive sheep-farmers in the north of Scotland. He holds the pastoral farm of Sciberscross, extending to about 39,000 acres, and the arable farms of Colaboll and Achnanearain at Lairg, measuring respectively, exclusive of outrun, 346 and 330 acres. He entered the first-named farm in 1875, and the other two in 1876. Sciberscross carries about 6000 sheep, and is rented at £1390. The Lairg farms winter about 2200 hoggs, and are rented at £500. The Master of Blantyre has three "hirsels" of blackfaced sheep. He has had two years' experience of them, and he finds them hardier and better able to withstand the winter than the Cheviots. Their advantage is specially noticeable at lambing time. He finds that the storm that would kill a Cheviot lamb would hardly affect a blackfaced lamb. He is of opinion that the Sutherland grazings would carry a third more blackfaced sheep than Cheviots, and that the greater part of the county will yet be covered with the former instead of the latter. He says that, owing to the climate seemingly becoming more severe, the mossing or cotton plant is fast disappearing; the difficulties to contend with as to heather burning; the old townships or green patches getting "fogged" and overgrown with heather, it is impossible to maintain as good a class of Cheviot sheep as was reared some years ago. He finds the wintering of his hoggs adds fully a second rent to his grazing land. He winters the

ewe hoggs in the south, and endeavours to keep them on grass till towards the end of February, when they are placed on yellow turnips for a month or six weeks to make them "shoot," or grow in the horn. He avoids, as far as possible, giving turnips, especially Swedes, to ewe hoggs, as ewe lambs wintered on turnips have frequently to be turned into the market with "broken" mouths. In the first week of April the hoggs are brought home, when the mossing or cotton plants should be out and should carry them on till the "deer-hair" grass comes about the second week in May. The mossing having been failing more and more every successive year, it is impossible to keep the hoggs from losing condition after returning from the wintering. The wether hoggs are kept on grass till December, when they are put on to turnips, and taken home at the same time as the ewe hoggs. The cost of wintering, including expenses out and back and herding, varies from 8s. to 10s. a-head. The Master of Blantyre also sends a few of the weaker dinmonts and gimmers to wintering. His stock is what is called a "regular" one, part ewes and part wethers; and he usually feeds his wethers and cast ewes in Derbyshire, where he holds a large farm. He has tried the wintering of hoggs at Lairg on grass and cake; and, while the hoggs thrive well under that treatment, he found the cost very little dearer than the usual system of wintering. On Sciberscross the average yield of wool is fully 5 lbs. per head. The Master of Blantyre smears all his sheep. The smearing mixture consists of tar and butter in equal proportions. Each tub contains 16 pints, with a pint of milk and a pint of seal oil added, and smears from 27 to 29 sheep. He employs in all fourteen shepherds; and his fanks, dipping-houses, and other similar accessories—all planned by himself—are most complete and convenient. The Hall family, so creditably connected with the sheep-farming of Sutherland, held Sciberscross for fifty-seven years prior to the entry of the Master of Blantyre, and kept one of the best stocks in the county, realising always the top prices at the Inverness Wool Fair.

In Creich, the first parish entered from the south, there are some good sheep farms. Mr John Kelly, formerly farm manager at Dunrobin, holds the farm of Achinduich, and keeps on it a very good and very old breeding stock. He sells his wether lambs at the Wool Fair, and delivers them at the usual time—about the first week in August. The ewes are sent away when four or five years old, the ewe stock being made up from his own ewe lambs. On this farm, near the river Shin, there is a good deal of green land, which yields good crops of hay; while some new land has been reclaimed higher up the side of the railway. The largest holding in this parish is Invercasley,

on the estate of Sir Charles Ross, Bart. of Balnagown, and entered eleven years ago, at a rent of £1400, by Messrs William and James Kennedy, who are also extensive farmers in the counties of Caithness, Inverness, Dumfries, and Kirkcudbright. Extending to about 35,000 acres, this farm consists mostly of black land, a good deal of it being high-lying, and cold and stormy in winter. A good ewe and wether stock is kept, tups being frequently introduced from Caithness and the south. The sheep on this farm are generally smeared in October and November with tar and butter. Clipping takes place about the end of June and beginning of July, and the ewe fleeces average from 3½ lbs. to 4 lbs.; and those from wethers, from 4½ lbs. to 5½ lbs. The hoggs are wintered in the south at a cost of from 8s. to 9s. a head. The cost of wintering has been more than doubled during the past twenty years. In severe winters such as last, hand-feeding has to be resorted to among the old sheep at home. The Messrs Kennedy have expended a considerable sum in repairing shepherds' houses and erecting fences and sheep folds, as also in surface-draining. Each shepherd has charge of from 500 to 600 ewes, or 1000 wethers.

The new farms in the parish of Lairg have already been referred to. The farm of Dalchork, extending to about 25,000 acres, and including 120 arable acres, has been held by Mr A. S. Macdonald since 1871. Part of this farm is very good pasture; but, on the other hand, there is a large stretch of scarcely any value. Most of it is flat and devoid of shelter. A good ewe and wether stock is kept, a few fresh tups being introduced from other stocks now and again. The old sheep are smeared after the 16th October. Four gallons of tar are mixed with 35 lbs. of butter, and that smears from 30 to 32 sheep at a cost of from 8d. to 10d. per head. The lambs are "dipped" before leaving for wintering in the south, and again on returning in spring. Clipping commences about the 12th of June. The hoggs are wintered partly on the arable farms on the south-east coast of the county and in Ross-shire; the ewe hoggs, when possible, on grass, and the wether hoggs on turnips. The lean dinmonts and gimmers are also sent to turnips and grass. The cost of wintering these averages close on 10s. a head. Each shepherd herds in summer from 600 to 700 sheep, but in winter the "hirsels" are reduced by sale and sending away to wintering to about 400 each. Six shepherds are employed on Dalchork. The death-rate ranges from 5 to 10 per cent. per annum. For every 100 lambs speaned, on an average, from 20 to 25 die before being sold as cast ewes or wethers. For every 100 ewes tupped, from 83 to 88 lambs are generally speaned. This year only 47 lambs were weaned for every 100 ewes. The Dalchork wethers sold at 43s. this year. The arable

land at Dalchork is rented at £1 per acre, and grows good crops of oats and turnips,—the former yielding about 5 qrs. per acre in a good year, and weighing about 42 lbs. per bushel. A few Highland cattle are kept on Dalchork. Another large and well-stocked farm in the parish of Lairg is Gruids, leased by Messrs Douglas Dobie and Thomas Martin.

In the neighbouring parish of Rogart is situated the extensive farm of Blarich, held by Messrs W. and D. Menzies. This fine farm was long held by Mr Andrew Hall of Calrossie, the representative of the well-known Hall family, so long located at Sciberscross. Mr Andrew Hall has perhaps a more intimate acquaintance with the pastoral districts of Sutherland than any other person, and was a remarkably skilful, painstaking, and successful sheep-farmer. His stock at Blarich commanded the admiration of all who saw them, and always fetched the top prices in the markets. The Blarich wethers this year brought 42s. 6d., and the cast ewes 33s. 6d. The largest holding in the parish of Clyne is Kilcolmkill, leased by Colonel Tod Brown, C.B., at a rent of £1171, and stocked with a superior class of sheep. In the adjoining parish of Loth, Mr John B. Dudgeon has in many respects one of the most desirable holdings in the county—the arable and grazing farms of Crakaig and Lothbeg—while he also leases the pastoral farm of Eldrabol in Kildonan. Mr Dudgeon has long kept a very fine stock of sheep, and has with much success bestowed a good deal of attention to the rearing of tups of the very best character. He imports tups from the best flocks in the south of Scotland; and, mating these with a few select ewes, rears tups that have few equals in the northern counties. At the show at Lairg last August, nearly all the higher honours for Cheviot tups fell to Mr Dudgeon. In the parish of Kildonan there are several large grazing farms well stocked with Cheviots, the more extensive being Kinbrace, held by the Duke of Sutherland, as already mentioned; Dalharn, held by Mr Sangster; Altandown, by Mr Gunn; and Kildonan, by the trustees of Mr Rutherford.

Crossing the mountains to the north-west coast from Kildonan, the traveller enters the Sutherland portion of the parish of Reay. The principal holding in this district is the fine farm of Bighouse, extending to about 60,000 acres, and rented at £1262 by Mr Robert Paterson of Birthwood, Biggar, Lanarkshire. Mr Paterson, who, it may be mentioned, has had the honour of being selected to act on the Royal Commission recently appointed to inquire into the agricultural depression, also leases farms of 1500 acres in Caithness, and 3000 acres in Lanarkshire, including his own property of Birthwood. He entered Bighouse in 1861. Along the banks of the river and burns there is a good deal of green land; but the greater portion is black and mossy. A

superior ewe and wether stock is kept on this farm. Owing to the bad seasons lately experienced, Mr Paterson has had to buy wether lambs and two-year old wethers to make up his stock. Those purchased are usually descended from his own stock, and come from Orkney, Lanarkshire, and Caithness. He generally rears his own tups, introducing one or two now and again to change the blood, from the best stocks in the south, usually Dumfriesshire. His sheep in Sutherland are "dipped" about the middle of October with either Macdougal's dip, or oil hellebore, tobacco, and spirits of tar. Clipping commences about the first week of June, and is concluded in the first week of July, The fleeces average 4 lbs. each in a good year. Three-fourths of the lambs are sent south when speaned at first of August, and the remainder from the 1st till the 10th of October. The first lot are away eight months, and entail an outlay in that time of from 10s. to 12s. a-head. The second lot are away six months, and their wintering costs from 9s. to 9s. 6d. a-head. The weaker animals, in the flocks kept at home, all get turnips, or are hand-fed. Each shepherd has charge of from 300 to 500 ewes, or from 600 to 800 wethers. The Bighouse stock has been considerably improved by Mr Paterson. His sheep are hardy, sound, and uniform, and command high prices. Mr Paterson has surface-drained a good deal of his farm, and limed some parts of it. He has also erected fences and some shepherds' houses.

In the parish of Farr there are several large pastoral farms. At the head of these may be placed the fine farm of Langdale, rented at £1343, 15s. by Mr P. P. Sellar, who also holds the arable farm of Culmaily in the parish of Golspie, and is besides a very extensive farmer in the county of Ross. Mr Sellar's stock is one of the best in the north of Scotland. Lying in Strathnaver, an extensive and good grazing strath, Langdale embraces a wide extent of good pasture, and rears heavy, well-conditioned sheep. Another extensive holding in this strath is Rhifail, which has been occupied for about twenty-one years by Mr Thomas Purves, who also holds two large farms in Caithness. Rhifail extends to about 30,000 acres, and is rented at £900. It consists of mixed hill pasture. On each "hirsel" there is an old township of green land, and on the sides of the several streams that intersect the farm there is a considerable extent of green pasture. The breadth of green land, however, is much too small to enable the tenant to take full advantage of the large area of high black land. Mr Purves keeps a good ewe and wether stock, which he maintains in high order by an occasional infusion of fresh blood. He purchases every year a few good tups from the best stocks in the county, and now and again introduces two or three from the south. Clipping commences between the 5th and 20th June, and the yield ranges

from 5 to 5½ lbs. of smeared wool. The Rhifail sheep are generally smeared with the best quality of tar and butter. Mr Purves winters the most of his sheep in Caithness, the average cost for hoggs being from 9s. to 10s. each, and for old sheep, 5d. to 6d. per week. The sheep kept on the Sutherland farm all winter are mostly hand-fed with hay and oats when that is necessary to sustain life, as it occasionally is. Mr Purves employs ten shepherds, and each has a "hirsel" of from 500 to 1000 head. The death-rate on this farm is from 7 to 10 per cent. in an ordinary year, and, with exceptional winters such as last, as high as from 15 to 25 per cent. Of every 100 ewe lambs weaned, from 12 to 14 die before the lot has to be sold as cast ewes. Of every 100 wether lambs weaned, probably about 85 remain to be sold as three-year old wethers. In an ordinary year every 100 ewes tupped nurse from 80 to 90 lambs. The death-rate among both old and young sheep has increased latterly. Mr Purves has reclaimed close on 150 acres of arable land at Rhifail. Oats and turnips grow well, but grass is unsatisfactory until the land has been limed. Oats weigh about 42 lbs. per bushel, and even this year they ripened well, and will yield over 5 quarters per acre. For the first crop of oats the land got a dressing of 3½ cwt. of guano, dissolved bones, and superphosphate. For turnips, the manure has consisted of a mixture of guano, dissolved bones, and bone meal, at the rate of 8 cwt. per acre. The average cost of the reclamation of the land, which has been accomplished in a most thorough manner, has been £40 per acre—trenching, £18; draining, £10; blasting stones with dynamite and clearing them off the land, £7 to £10; and building dykes 5½ feet high, £5 per acre. This outlay is borne by the Duke of Sutherland, Mr Purves paying 2½ per cent. of interest for ten years, and 5 per cent. during the remainder of the lease. In addition to the £40, the preparing of the land per acre has cost Mr Purves an average of £12 per acre. The quantity of stones in the land was great. After drains and dykes had been supplied, the removing of the remainder cost no less than £7 per acre. Mr Purves has also, at his own expense, reclaimed and laid down in grass about 20 acres. Since Mr Purves entered Rhifail, the Duke has built upon it a handsome dwelling-house at a cost of £1800, four houses for shepherds, ploughmen, and women servants, at a cost of about £250 each, and a good farm steading at about £1200. Mr Purves contributed between £200 and £300 to the cost of the dwelling-house, besides carting the materials for all the erections, and the slates, lime, and wood having to be carted over a very bad road. Mr Purves has also formed and fenced with dykes, 5½ feet high, five sheep parks at different parts of the farm, averaging in extent about 20 acres each. In addition, he made an excellent garden, and planted shrubberies

around the dwelling-house at a cost of several hundred pounds. In all, on these improvements, Mr Purves has himself expended considerably over £2000, including carting materials for buildings. During his occupancy he has twice surface-drained his farm at a cost of over £500, built a good many sheep "stells" for shelter, and sown a great extent of whins. He at one time grazed about 80 Highland cattle. He has none at present, but intends bringing in about 40 stirks to consume the straw and make manure. To make up the deficiency caused in his stock by the severe winter of 1859–60, Mr Purves tried a few hundred blackfaced sheep, but they turned out badly. The ground, he says, is too flat and soft for them, and he had great loss among them from drowning and other accidents. On some "pining" ground on the farm, six of the blackfaced sheep were affected for every Cheviot that suffers. Those that survived grew into very good sheep. The other larger farms in this parish are Clebrig, occupied by Messrs Marshall and Scott; Skelpick, by Mr Donald Mackay; and Armadale, by Mr W. J. Patterson. At Skelpick, about 100 acres of land have been reclaimed at a similar cost, and under similar conditions as the land at Rhifail. The Clebrig wethers brought 39s. this year (1879), or 4s. below the price obtained last year.

The farm of Ribigill, rented by Mr William Mitchell at £1465, is the largest holding in the parish of Tongue, and one of the best managed in the county. Ribigill extends to about 30,000 acres, and along with it Mr Mitchell holds the farm of Pulrossie, containing 400 acres arable, and 140 acres of wood pasture. Mr Mitchell has occupied the former for eighteen years, and the latter for eleven years. The pasture of Ribigill is fully equal to the average of the north and west of Sutherland, there being a good deal of green land on it. It is, however, subject to severe snowstorms in winter and spring. On Pulrossie the soil is partly good sharp loam and partly poor clay. It grows turnips better than any other crop. A very fine ewe and wether stock is kept on Ribigill. Mr Mitchell buys in to keep up his wether stock, and for the last few years has had to buy ewe lambs and hoggs. These he generally obtains in the Muir of Ord market. He frequently introduces tups from the best stocks in the country, such as those of Hindhope, Kirkhill, and Archbank. Mating these with a few select ewes, he rears a class of tups for himself that produce excellent lambs. His sheep are dipped twice a-year with castor oil and tobacco, a little arsenic being generally added. Castor oil is only used once a year. He also uses Martin's dip. The cost of the winter's dip is about 3d. per head, and that for the summer, 1d. The clipping takes place between the 10th and 30th of June. Hoggs and lean sheep of all other ages are wintered on arable land, while a few of the

weaker sheep are generally hand-fed on the grazing farm. The wintering for hoggs cost on an average 10s. a-head. Each "hirsel" numbers from 400 to 700 head, according to the character of the land and the class of sheep. Mr Mitchell employs eight shepherds and three turnip herds. The death-rate is from 7 to 10 per cent. Every 100 ewes tupped rear about 70 lambs. Of every 100 lambs weaned, about 80 will be suitable for being kept for stock, the other 20 being dead before marking or weaning time or sold as "shotts." Of every 100 "sorted" lambs, 70 or 75 may live to be sold either as wethers or cast ewes. Mr Mitchell has expended a great deal of money on improvements on Pulrossie—on draining, liming, subsoiling, repairing, and erecting fences and cattle sheds. He has also spent a large sum on surface-draining, building houses, and erecting fences on Ribigill. At Ribigill the Duke has recently reclaimed over 150 acres, under similar conditions as those already indicated. The work was carried out by Mr Crawford, factor on the Tongue district of the Sutherland estate, and his son, and has been done in a most efficient manner. Steam power was used in part of the work. There were 85 acres under oats this year, and 30 under turnips. Both crops were good. The Duke gives lime to his tenants for the reclaimed land at interest on the price. Mr Mitchell has also limed part of his sheep farm, and has observed great improvement.

Melness, the largest farm not only in the county, but, perhaps, in the kingdom, lies partly in the parish of Tongue and partly in the parish of Durness. It is supposed to extend to over 70,000 acres. It has been occupied by Messrs Donald and William Mackay—father and son—for thirteen years, and is rented at £1257. Mr Donald Mackay, as already stated, leases the farm of Skelpick in Strathnaver, while, together, the father and son pay upwards of £3000 of rent for sheep and arable farms in Caithness. A few years ago, the entire extent of their farms was close on 150,000 acres. It may, perhaps, be said that they are, in regard to acreage, the most extensive farmers in the United Kingdom. Mr Donald Mackay was a son of one of the small tenants evicted from part of the farm of Melness (then the property of Lord Reay) when sheep-farming was introduced into the county. Beginning life in Caithness at an early age, Mr Mackay rose, step by step, and has achieved his present affluent position entirely through indomitable perseverence and much tact and ability. He and his son are, so far as known, the only instance where the descendants of the evicted tenants have made their way back to the ground once occupied by their forefathers. Melness is almost all hill pasture, with but very little green land. This makes it impossible to keep as many ewes as would maintain a sufficient wether stock, and compels the Messrs Mackay

to go to the market every year for wether lambs and hoggs. The stock on the farm is descended from that held by the late Mr Paterson, the former tenant, but has been largely crossed by sheep from other farms held by the Messrs Mackay, as well as from the other well-bred stocks in Sutherland. The tups are reared on the farm, fresh blood being introduced from the south every second or third year. All the old sheep are smeared with tar and butter, the lambs being dipped with Wilson's dip. The smearing costs about 8d. a-head, and dipping 4d. a-head. Clipping commences with the wethers, about the 6th or 10th of June. The most of the hoggs are wintered on their farms in Caithness, the remainder being sent elsewhere and wintered on grass and turnip at a cost of from 8s. to 9s. each. The shepherds on Melness herd each, on an average, about 450 in winter and 650 in summer. The death-rate is fully 10 per cent. It is seldom that more than seventy-five lambs are speaned for every one hundred ewes tupped. Of every one hundred hoggs sent to the hill in spring, not more than seventy live to be sold as cast ewes or wethers. The death-rate is greater than some years ago. There are about 90 acres of arable land on Melness; but, owing to turnips having ten consecutive years succumbed to "finger and toe," the most of it has been laid down in grass. Of these about 50 acres have been recently reclaimed by the Duke, on the usual conditions, at a cost of about £40 per acre. The weaker sheep are gathered off the "hirsels" every month in winter, and are hand-fed on the arable land. Since entering Melness the Messrs Mackay have expended about £1000 in surface-draining and other improvements. When the late tenant's stock on Melness was sold by public roup, at Whitsunday 1866, the roup-roll amounted to £18,500. It is stated that when he entered about 1828, the stock cost him only from £3000 to £4000. Owing to ravages of rinderpest the prices in 1866 were exceptionally high, and the Messrs Mackay paid 70s. for every ewe and lamb purchased at the sale.

In the parish of Durness there are some very large holdings. The fine farm of Eriboll, extending to between 30,000 and 40,000 acres, and rated at £1307, has been held by the Clarke family for sixty-four years. The present tenant is Mr George Granville Clarke, grandson of the original tenant, whose name has already been mentioned among the pioneer sheep-farmers of the county. Eriboll consists of mixed land, much of it moory, very rocky, and wild, and little of it green except on the seaside. The winter is often wet and stormy, but the farm is not subject to long-continued snowstorms. An excellent ewe and wether stock is kept: no ewes ever being bought in, but 300 wether lambs are purchased yearly. One or two tups are bought in every

year and put to picked ewes, the tups being selected from the progeny. Mr Clarke generally buys from the flocks in Sutherlandshire, which he knows to be the purest, most suitable to his land and climate, and least crossed with south country blood. He smears part of his stock with tar and butter in October, and dips the others with Macdougal's dip, along with some tobacco juice and half a pound of best butter to each sheep. Clipping commences about the 10th of June and ends about the first week of July—according to the season, condition of the stock, and the weather. The yield ranges from 3½ lbs. from dipped hoggs to 6 lbs. from smeared wethers. The wether hoggs are sent away to wintering, which costs from 8s. to 10s. a-head; it has been even as high as 12s. a-head. Ewe lambs are wintered at home, partly on the low lying ground kept specially for "hogging" and partly on the arable farm. The dinmonts and weak sheep of other ages are taken from the hills and recruited with turnips in winter and beginning of spring. There are about 150 acres of arable land at Eriboll, worked on the six-shift rotation. Oats yield from 3 to 5 quarters per acre, and weigh from 40 to 42 lbs. per bushel. Turnips also grow well. The present tenant's grandfather and father reclaimed about 80 acres, while the Duke recently reclaimed the other 70 acres by pick and spade, at a cost of about £40 per acre. Interest is paid here as in the other cases. Mr Clarke has expended between £500 and £600 in surface-draining on his farm since 1872, this sum having been expended many times over by his father during his tenancy. He keeps six or seven cross cows, buys shepherds' calves when fostered, and then rears from fifteen to twenty stirks, sending them to his farms in the low country. Mr Clarke is also an extensive farmer in Easter Ross. The Eriboll wethers brought 40s. this year, and cast ewes 30s. 6d.

Another holding of about equal extent in the parish of Durness, is the farm of Balnakiel, rented by Mr John Scott at £1385, and managed in the same manner. Keoldale, rented by Mr John Scobie at £1200, lies partly in Durness and partly in the parish of Eddrachilles, and carries a very fine stock. In the latter parish is situated the highly picturesque and valuable grazing farm of Glendhu, rented at £1395 by Mr James Gunn. In Assynt there are several large holdings; the most extensive is Drumswordlan, rented by Mr John Scobie at £1000, and the next largest is Achumore, occupied by Mr John Elliott at a rent of £893.

The General System of Management on Sheep Farms.

Excepting a few lots of blackfaced sheep kept by the Master of Blantyre and a few others, the entire fleecy stock of the county

is of the Cheviot breed. It has been so for more than half a century; and, during all that time, the change in the system of management has been so slight as scarcely to be worthy of notice. The pastoral farms of the county carry what are technically known as "ewe and wether" flocks, that is, mostly self-sustaining flocks, that throw into the market every year a crop of cast ewes and of three-year old wethers. These ewes and wethers are delivered to the buyers direct from the hills about the 1st of September; and, though they usually leave the country in good condition, they are not prepared for the butcher. On a few of the large arable farms on the south-east coast, such as Culmaily, Crakaig, Dunrobin Mains, and Clynelish, a number of ewes and wethers are fed annually on grass, turnips, and cake. But these are exceptions. Sutherland is a breeding and rearing, not a feeding, county. Some farmers sell their lambs to be delivered about the same time as the older sheep, thus keeping few except breeding animals; but this also is an exception.

Perhaps the best idea of the details of management in the system of sheep-farming pursued in Sutherland may be conveyed by taking a typical hypothetical case of a tenant entering a farm at Whitsunday, the usual term of entry, and by following him throughout his first twelve months. He would take over from the outgoing tenant, at a valuation fixed by mutually-chosen arbiters, a ewe and wether stock corresponding to say 2000 ewes. In an ordinary year from 75 to 85 lambs are nursed for every 100 ewes tupped, so that, alongside the 2000 ewes, there would be at least 1500 lambs. The death-rate per annum, in ordinary seasons, is from 5 to 10 per cent. Taking it at the higher rate, the supposed incoming tenant would find 1350 one-year old sheep, say 675 gimmers and 675 dinmonts, and, in round numbers, 610 two-year old wethers and 550 three-year old wethers; he thus commences operations with a grand total of 6010,—2000 ewes, 1500 lambs, 675 gimmers, 675 dinmonts, 610 two-year old wethers, and 550 three-year old wethers. Besides two or three "turnip herds," or shepherds who go with hoggs to the wintering, there are seven shepherds on the farm, each of four having under his charge 500 ewes and their lambs. The ewes occupy the lower and the greener land, the others the higher and blacker. Clipping commences with the "eild" sheep from the first week of June till the first week of July, according to the season, weather, and condition of the stock, the smeared sheep having been washed immediately before. White or dipped fleeces weigh from $3\frac{1}{2}$ to $5\frac{1}{2}$ lbs., smeared fleeces from $4\frac{1}{2}$ to 7 lbs. Perhaps, before the clipping is finished, the tenant goes to the Inverness Wool Fair, usually held about the second week of July, and, on the reputation the stock of the farm may have earned, sells his three-year old wethers, and perhaps also his

"shott lambs" and "cast ewes," the ewes being four or five, perhaps a few even six, years old. He may also dispose of his wool at the fair, or may store it at home, or consign it to a broker, most likely either in Leith, or Edinburgh, or Glasgow. He may likewise purchase his smearing and dipping materials. The weaning of the lambs, an important operation, takes place in the last week of July or first week of August. When taken from their mothers the lambs are "sorted," that is, the worst are drawn and delivered at once to the purchasers if they have been sold, or sent for sale to the Muir of Ord or other market. The others of the year's crop are put on to the greenest of the land, reserved for the purpose, and, if the pasture is sufficiently good, kept there till the first week of October, when they are sent for wintering either to an arable farm on the south-east coast of the county, or to Caithness, Ross, Moray, or elsewhere. If there is not sufficient green pasture on the farm, the lambs are sent straight from their mothers to grass in whatever district they are to be wintered. During the first ten days of September the sheep sold at the Inverness Wool Fair, in other words, the cast ewes and three-year old wethers of the year, are delivered to the purchasers, the sheep being driven to the nearest railway station, and conveyed thence by rail. If the tenant is not satisfied with the prices offered at the wool fair, he may accept the alternative of going south with his "cast" to Falkirk Tryst, and take his chance of the prices there. The "lots" sent away consist of the 550 three and a half year old wethers, and about 500 ewes drawn according to age and condition of teeth. By the sending away of this draft, the "hirsels" that remain are reduced to numbers that are more easily managed in winter. Before being sent to the wintering the lambs are dipped with oil and tobacco-juice, or some other solution, at a cost of less than 3d. a-head. That operation over, and the hoggs having left, attention is at once directed to the preparing of the "hirsels" remaining at home for the approaching winter. The "hirsels," invariably the wethers, occupying the higher and colder ground, are smeared with a mixture of tar and butter in equal proportions, with perhaps a little oil and milk added, the cost being from 8d. to 10d. a-head. The remainder of the stock is dipped with a solution similar to that with which the lambs were dressed. The tups are sent to the ewes about the 22d of November, and taken back about Christmas, from forty to fifty ewes being allotted to each, a few of the strongest and hardiest of the gimmers being also tupped. The tenant requires from forty-four to fifty tups. Most of these he would have among the stock taken over at valuation, but a few have been bought in from the best bred and most suitable flocks in Sutherland and in the south of Scotland. Two or three of the better bred tups are mated with choice lots

of ewes, the intention being to select from the progeny thus raised tups for future use. During the winter the younger sheep are placed on the best ground on the farm, and from each "hirsel" weakly animals are drawn together and kept on green land, or hand-fed with hay and oats if necessary. If the winter is "open" and the pasture good, none except specially weak sheep require hand-feeding; but, if the winter is severe, the younger "hirsels" get a little hay or a slight daily feed of turnips, if these are raised on the farm. Hand-feeding is a bad custom in the case of hill sheep, and therefore it is resorted to only in cases of real necessity; when, for instance, as in last winter (1878–79), the animals would not survive without it. The ewe and wether hoggs are wintered separately,—the former on grass as much as possible, getting a month or more of yellow turnips in spring. The wether hoggs are wintered largely on turnips. The hoggs are usually away at wintering about six months, and thereby entail an outlay, including herding and conveyance, of from 8s. to 10s. each, the average being about 9s. The cotton grass, or mossing, is pretty well forward in ordinary seasons by the end of March; and when the hoggs return, about the first week of April, they are dipped and sent on to the cotton grass, which maintains them till the deer hair and other plants come up early in May. Lambing commences about the 20th of April, and for more than a month the care of the young stock is a subject of much anxiety to all on the farm. In May the lambs are branded and tarred with the farm and "hirsel" marks, each "hirsel" having a different mark or number; while, at the same time, the male lambs are castrated. The twelve months are now at an end, and the supposed tenant is left with as near as might be the same number and classes of stock as when he was supposed to have entered the farm.

There are some deviations from the system illustrated by the preceding hypothetical case. There are not many of the Sutherland farms entirely self-supporting, or that can maintain as many ewes as will provide them with a sufficient number of wethers to graze their wether land. Most of the tenants therefore have to buy wether lambs and hoggs, and these they usually obtain either from other farmers in Sutherland, who keep only or mainly breeding stocks, or from other counties in the north. Smearing is not so general as it was at one time, a good many having abandoned it in consequence of the heavy outlay it entails. Now, nearly all the sheep, especially ewes, on the lower lying farms are kept white. Some difference of opinion exists as to the rearing and selection of tups. Latterly, a good deal of southern blood has been introduced through tups, and some contend that this has exercised a softening influence on the Sutherland Cheviots, and that they are, therefore, not so

well able as formerly to withstand the rigorous climate of the county. The milder and better way of introducing fresh blood, which most Sutherland farmers now pursue, is to mate a few of the best bred ewes in the flock with tups of the finest stamp and breeding from the better suited stocks wherever situated, and then, from the lambs thus raised, select the tups to be used in the general stock. Some of the best farmers in Sutherland never go beyond the northern counties for tups, and it is pretty certain that thereby they have better preserved the hardy character of their stocks. On some farms that have arable land attached, the ewe hoggs are wintered at home on the "hogging" part of the grazing farm with a small supply of turnips and hay, and grain if necessary; a good many farmers, on the other hand, have latterly found it expedient to send the weaker of their dinmonts and gimmers to wintering on arable farms,—a step rendered necessary by the deterioration of the green pastures in Sutherland. It is estimated by competent authorities that 60 per cent. of the stock of lambs is wintered out of Sutherland, mostly in the counties of Caithness, Ross, and Moray; 32 per cent. on arable farms on the south-east coast of Sutherland, including the arable farms at Lairg; and the other 8 per cent. on the sheep farms and on the patches of arable land on the north and west coasts.

Export of Sheep and Wool, and Rent of Land.

Export of Sheep.—There was so great a mortality among sheep last winter, particularly on the eastern side of the county, that it is not easy to estimate the number of ewes and wethers sold and sent out of Sutherland this year. In average years the drafts of each would number from 20,000 to 25,000; but this year they must have been very much smaller. One of the largest farmers in the county estimates this year's sales of wethers at about 15,000, and of ewes 11,000. When delivered at three and a half years old Sutherland wethers would weigh from 58 to 65 lbs. dead weight, the average being about 60 lbs. This year the wethers from the county brought from 40s. to 44s., cast ewes from 26s. to 38s., and lambs at from 18s. to 23s. Last year the prices for wethers were higher by from 3s. to 4s. a-head, and for ewes about 1s. a-head.

Wool.—The average number of fleeces of wool clipped in Sutherland in each of the last ten years would have been about 170,000. The average weight of the fleeces may be taken at 4 lbs. each, which would make the total annual yield of wool 680,000 lbs. or about 28,333 stones of 24 lbs. This year the clip is far short of that, and has been estimated by a competent authority at 18,392 stones of smeared wool, worth 15s. per

stone, or 2s. 8d. per sheep; and 6500 stones of white wool, worth 22s. per stone, or 2s. 7d. per sheep. The total yield of wool this year would thus be 3441 below the average of the preceding ten years. The following is pretty near the average yield of wool per head in ordinary seasons:—

Wethers and Dinmonts (smeared),	5 to 7 lbs.
„ „ (white),	4 to 6 lbs.
Ewes and Gimmers (smeared),	4½ to 5½ lbs.
„ „ (white),	3 to 4½ lbs.
Hoggs (smeared),	4 to 5 lbs.
„ (white),	3 to 4 lbs.

Rent of Land.—The annual rent of the Sutherland sheep farms is fixed at so much per head of the number of sheep each is estimated to carry throughout the winter. Between 1844 and 1846 Mr Andrew Hall of Calrossie, then himself a large sheep-farmer in the county, went over the whole pastoral range of Sutherland, rearranging the boundaries of some of the larger farms, estimating the number of sheep each would carry throughout the winter, and fixing the rent per head to be asked for each at the next letting, which began in 1852. Since then rent has been charged according to that estimate. Previous to 1852 no tenant in the county paid more than 3s. a-head, Mr Andrew Hall himself being the first to pay 3s. 6d. a-head in that year for Blarich. The rate of rent now ranges from 4s. to 7s. a-head, the average being perhaps about 5s. 6d. The increase since 1852 is thus equal to close on 100 per cent.

Losses of the Winter 1878–79.

"Every twenty-second year is a bad one for the sheep-farmer," was the laconic remark of an experienced and observing Sutherland sheep-farmer to the writer the other day. In regard to the past hundred years, at any rate, the observation has been almost literally true; for are not 1772, 1794, 1816, 1838, and 1860 ever to be remembered as years of great disaster among flocks on the hills of Scotland? According to the twenty-two years' rule, the almost unprecedented storm of last winter (1878–79) came too soon, if it may not indeed be followed by another severe season a year or two hence—just as the storm of 1814 was followed by that of 1816. Be this as it may, the last winter was certainly one of the most disastrous ever experienced by Sutherland sheep-farmers. It has been stated, on good authority, that on an average in each of these notable years of disaster, Scotch sheep-farmers—at any rate those in the northern counties—lost about one-fourth of their invested capital. If a few farmers on the west coast are excepted, the loss

caused by last winter to the other portion of the county of Sutherland cannot be much under that amount. The estimates vary from one to three and a half years' rent; the average, with the exceptions referred to, being perhaps about two and a half years' rent,—or, say from 14s. to 15s. for every sheep for which rent is paid. Along the coast, particularly the west coast, the snowfall was not so great as to prevent sheep from getting at the pasture by their own exertions; but the whole of the interior of the county lying east of a line drawn from Loch Eriboll to Loch Shin was enveloped in a deep covering of snow for nearly four months. On the higher mossy table-lands, 3 feet of closely-packed frost-bound snow lay for three months. In these regions the severity of the winter, of course, made the greatest havoc. Mr Purves, Rhifail, states that three years' rent, or £2700, would not cover the loss caused to him by the severe winter. He had to remove all his sheep to railway stations and to Caithness, the shortest distance being over 20 miles, and had to hand-feed them with hay, grain, &c., for ten weeks, at a cost of over £1000. His loss by death was fully £1200 over that in ordinary years; while he had about 1000 fewer lambs and one-third less wool. Other two extensive farmers on the north coast estimate the loss at three and a half years' rent, the deficiency in the crop of lambs being estimated at 63 per cent. Not only was the crop of lambs reduced by the severe winter to one-half the average number, but a much greater proportion than usual of those that did survive have had to be sold as "shotts." Indeed, the whole crop is of inferior quality, and can never fully attain to the standard of their respective flocks. A large number of the lambs were so weak when weaned this year, that they had to be sent directly from their mothers to grass on arable land in the county or elsewhere, which has added about 2s. 6d. a-head to the usual cost of wintering, bringing it up to fully 11s. a-head. On one farm on the east coast, a flock of 500 ewes reared only 50 lambs; while of the ewes, only 200 survived the winter and spring. On another farm on the same side of the county, a whole flock of 500 lambs, with the exception of 40, succumbed to the storm. The amount of hay, cake, grain, and other food consumed in the county during the three months of the storm, was extraordinary: special trains having been run on the Highland Railway every other day conveying hay from Ross and Inverness. The outlay on hand-feeding alone amounted, in some instances, to from 12s. to 14s. a-head. Perhaps no stock in the county was so well carried through the storm as that of the Master of Blantyre. He kept his sheep going during the first month of the snow-storm by clearing roads by men and shovels in the rankest heather; and also by clearing, every second or third day, a

sufficient extent of green land to afford foggage, to enable the lots to mix with the heather a bite of softer grass. No break having come in the storm, and as the snow became bound with frost, box-feeding was commenced at the end of the month. The flocks were reduced to lots of from 200 or 300 head; and each animal got per day ½ lb. bruised oats and ⅛ lb. bran, with 24 lbs. of hay to the score. This feeding was continued till May, or for nearly five months. When the ewes became pretty heavy with lamb, ¼ lb. of linseed cake was substituted for the ½ lb. of bran. Such heavy feeding necessarily entailed a heavy outlay, but at weaning time the crop of lambs numbered about 90 for every 100 ewes. Without the box-feeding, there would have at least been 40 per cent. fewer lambs; and the cost of the feeding would not perhaps have done much more than make up the crop to 90 per cent. Then the advantage of having lambs of his own breeding, and of having his older sheep brought through the winter in good condition, is of considerable account.

Profits now and Twenty-five Years ago.

During the first twenty-four years of improved sheep-farming in Sutherland, or between 1806 and 1830, the tenants had to face many stubborn difficulties, and met with several serious reverses of fortune. Some were ruined, and, at one time, none in the Reay district of the county were able to pay their rents, which in several cases were reduced, by the Marquis of Stafford, to the extent of 48 per cent. The revival of trade about 1832, however, made the industry much more lucrative, and most of the original pioneer tenants became men of means, while a few may even be said to have amassed moderate fortunes. But such fortunes are evidently not in store for the present race of occupiers. Indeed, it would seem that the tide has turned somewhat against them, and that Sutherland sheep-farming has reached what threatens to be a turning-point in its history. Perhaps, on the whole, though not nearly so lucrative as at some former periods, the industry was fairly remunerative to the present tenants up till 1874. It is generally estimated, indeed, to have yielded from 5 to 10 per cent. on the capital invested. But, during the past five years, not only has there been little or no profit even on the cheapest farms, but on the majority there has been considerable actual loss. No doubt, the actual loss of later years is due mainly to excessively bad seasons, which may not again be experienced in such terrible severity for many years. It is asserted, however, that, leaving bad seasons out of calculation, Sutherland sheep-farming in its present condition cannot be expected to yield even moderate interest for the money invested in it. In support of that statement, it is pointed out that the

pasture on the grazing farms, especially on the green land, has seriously deteriorated, compelling tenants to send a greater proportion of the stock off the farms for wintering, and causing a much higher death-rate among sheep of all ages; that the restrictions put upon heather-burning by lessees of shootings also lessen the value of hill grazings; that the cost per head of wintering has been doubled during the past twenty-five years; that there has also been a great increase in the ordinary working expenses of the farms,—such as shepherds' wages, and expenses of clipping, smearing, and dipping; again, that the prices of both wool and mutton have fallen latterly; and lastly, that rents are too high, —or, perhaps, rather that, with the deteriorated pastures, the farms will not now carry the number of sheep allotted to them by Mr Andrew Hall in 1846; and that, therefore, rent is charged for more sheep than the farms can really maintain.

The first of these positions—the deterioration of the green land—is perhaps the most important; indeed, it lies at the root of the whole matter. The writer has, therefore, made special effort to obtain in regard to it the experience of the great body of the sheep-farmers in the county, more particularly those who have had the most lengthened tenancy. In response there has been but *one* voice—that there has been marked deterioration. A few samples of the singular uniformity of the testimony on this point may be given. One says:—"The old lands cultivated by the tenants, which constitute most of our green land, are getting useless with fog and waste, and no wonder, if you consider that for fifty years all has been taken out of it and *nothing whatever* put in (sheep lying on the high ground at night). Our land now won't keep one-third less sheep so well as twenty-five years ago. Besides, the sportsmen and gamekeepers prevent us getting the hill-ground burned as it ought to be. The evil is rapidly increasing." Another:—"Our green pastures have deteriorated very much. The green land formerly cropped by the small tenants has gone back. Most of it carries stock from the age of a lamb till three and a half or five and a half years old, and, as a matter of course, the bone comes out of the ground, and nothing is done to replace it. On an estate where each farm is rented at so much per head for a fixed number of sheep, I think the landlord ought to put the land into a state to carry the number for which he gets paid, at the beginning of every lease, or reduce the number charged to that which the ground will carry." Another: —"The pasture on the green land has deteriorated greatly. To a great extent it was originally reclaimed from heather, and has gone back to its wild state. What was reclaimed even twenty years ago is growing worthless daily, and will require, not only liming, but, I fear, to be broken up and laid down anew." Another:—"Owing to the climate seemingly becoming more

severe, the mossing or cotton plant fast disappearing, the difficulties we have to contend with in heather burning, owing to the sporting tenants, the towns or green patches getting fogged and overgrown with heather, it is impossible to keep as good a class of Cheviot sheep as was, comparatively, kept a few years back." Another:—"Green lands have deteriorated undoubtedly. They have become fogged, and gone back to a state of 'nature.'" Another:—"The pasture on sheep farms has undoubtedly deteriorated a great deal, owing to the stringent conditions imposed regarding heather burning, and the green spots throwing up fog which chokes the grass." Another:—"Pasture in Sutherland on green land has deteriorated during the past twenty-five years, principally through the grass being choked with fog or moss." Another:—"The farms do not nearly carry the number of stock they did twenty years ago, nor are the sheep stock the same quality. This is easily accounted for by the state of the grass, and, more especially, the strict restrictions in burning the heather laid down of late years to suit sportsmen." Another:—"The grazings are not nearly so rich as they were twenty years ago. They cannot maintain the same number of stock as formerly, and, therefore, a large portion of the young stock has to be wintered away in the neighbouring counties of Caithness and Ross at a very high expense." Lastly may be given the following striking proof of the alleged deterioration as told to the writer by a prominent farmer in the county:—"Twenty-two years ago a friend of mine put a little over 1100 hoggs on to a piece of grazing land in Strath Brora for the winter. At the usual time in spring 1030 were returned to the hill in good condition, between 30 and 40 of the weaker ones being retained a little longer. Eleven years afterwards the same gentleman put 400 hogs on the same piece of land for wintering, and before the winter was half over he had to take them to an arable farm and give them turnips. In each of these two years the land had been specially preserved as hogging land."

These testimonies should sufficiently establish the truth of the position that the green pastures have deteriorated during the past quarter of a century. But could they have done otherwise? Is not the thing self-evident? Originally there was little green land in Sutherland. The natural condition of the greater portion of what has formed the green land of the grazing farms was not producing green grasses, but heather, moss, ling, bent, and other coarse plants common to such situations. It was reclaimed and enriched for the production of the green and finer grasses by the many hundreds of small tenants who long occupied the straths in the interior of the county. About sixty years have elapsed since these tenants gave up their holdings to the fleecy tribe. During all that period the land thus left in good con-

dition for raising green pasture has been constantly grazed by a heavy, hungry stock of sheep, that have browsed upon it all day, and spent the night on the higher and blacker land, where they have also left the richest of their droppings. The green lands thus received little or nothing of even the droppings of the animals that fed upon them. They received no manure, and no artificial nourishing of any kind. They have had to rely solely on the repairing forces of unaided nature, and ever active as these are, in this case they have been unequal to the consuming power. As stated in one of the preceding evidences, sheep are fed on the green land till from three and a half to five and a half years old, and yet nothing whatever has been done to restore to the soil the great quantity of phosphates withdrawn from it annually for sixty years, in the shape of the bone of the animals. Can it be surprising then that at last the soil has become impoverished, so devoid of the elements essential to the growth of green grasses, that these are fast disappearing, and coarser plants coming up in their stead? It is but the very nature of things that this should be so. Nature will have its due. Green grasses, being finer varieties, require richer soil than heather, bent, ling, moss, and other coarse plants common to the Sutherland hills. Until enriched by cultivation, these green lands in Sutherland grew little but heather, bent, ling, and moss. Having again become poor, they throw off the new and finer, and take back the old and coarser, vegetation.

The cure for this growing evil would not be difficult to find were it not that the expense would perhaps exceed the advantage derived. It is indicated by a leading farmer in the county, who says:—"The only cure is liming the land with from 25 to 30 bolls per acre. But the carriage is so difficult that no tenant could face it. Lime costs 3s. per boll on the coast, and carriage from ten to twenty miles would be equally as much, which would bring the lime to 6s. per boll, and make the cost of the dressing from £7 to £9. That may be said to be a prohibitive price. I tried from 7 to 8 cwts. of bones per acre, which had a good effect, making the pasture sweeter. Sheep were fonder of it, and ate it barer than usual; but it would need double the allowance to put out the fog and do the work of a proper liming. I have no doubt if our lands were limed one-third more sheep could be kept. Our gravelly soil is completely void of lime and wont grow grass without it, even when cultivated." Another extensive farmer says that he has used lime on the green land, and has seen much benefit result from its use. By some the breaking up and sowing out of the land anew is recommended as the most effective cure. No less an authority than Mr Andrew Hall of Calrossie thinks the best plan would be to plough the land, dress it liberally with bones and lime,

and sow it with some strong variety of oats and a mixture of vigorous grasses, the grain to be consumed by the sheep as it grows. That cure would perhaps be as effective as any, but would also be expensive. In the settlement of this important question—and it will sooner or later press itself for settlement—the Duke of Sutherland and his tenantry have, indeed, a stubborn difficulty to deal with.

In regard to the other positions of disadvantage taken up by the sheep-farmers of the county little need be said. There is no doubt that the restrictions latterly put on heather burning have had a decided deteriorating tendency on the grazings. It is well proved that the interests of sheep and game are identical as to heather burning. What is beneficial for the one is also beneficial for the other; and, therefore, it is somewhat strange that sportsmen should be so much opposed to heather burning. It has been shown that a much greater number of young sheep have now to be wintered out of the county than formerly, and that the cost of that wintering has doubled during the past quarter of a century, or advanced to an average of about 9s. a-head. The death-rate has increased by nearly 50 per cent. since 1852. The causes of this are stated to be partly bad seasons, largely limitation of heather-burning, and, perhaps, to some extent, the deterioration of green pasture. Shepherds' wages and other working expenses have increased fully 30 per cent. during the past twenty-five years. The decline in the price of wool has been material. The average top price of Cheviot laid wool at the Inverness Wool Fair during the past ten years was a little over 25s. per stone of 24 lbs. During the preceding ten years the average was over 28s. per stone. As has been seen the prices this year are far below these averages. The colonial wool has to a large extent taken the place of Scotch Cheviot wool in the making of tweeds, and there is, therefore, a somewhat bad prospect of Scotch Cheviot wool attaining to its old position. The value of mutton has also got a decided check, and it is to be feared the American supply may prevent it from again reaching the maximum price of recent years. The rate of rent, as has been shown, has increased 100 per cent. since 1852, or from 3s. to from 4s. 6d. to 7s. a-head. With the deteriorated condition of the green land and the numbers charged for on each farm, the present rate of rent is generally considered from 25 to 30 per cent. too high.

Cottar Farming.

According to the Returns collected by the Highland and Agricultural Society in 1853, there were at that time in the county of Sutherland 2680 crofters. Of these there were 557 in the parishes of Assynt, Eddrachilles, and the western portion of

Durness; 704 in Farr, Tongue, eastern portion of Durness, and the part of Reay in Sutherland; 785 in Dornoch, Creich, Lairg, and Rogart; and 634 in Clyne, Golspie, Kildonan, and Loth. The total extent of hill and arable land held by these 2680 crofters was estimated at 106,864, of which 10,276¾ was given as arable. That would represent that on an average each crofter had close on 4 acres of arable land and about 36 acres of outrun each. The outruns, however, were in reality held as "commonty" by a certain number of crofters. In that year they had 2359 acres in barley, 3971¾ acres in oats, 7 acres in rye, 19¼ in pease, 366 in turnips, 2121 in potatoes, 1143¾ in grasses under rotation, and 264½ acres of improved and enclosed permanent grass. Their horses numbered 1979, milk cows 5261, other cattle 3471, their sheep 13,646, and their swine 827. They had thus an average of two cows and of over five sheep. Since that time there has been little change in the numbers or possessions of these crofters. They have no leases, and pay from 15s. to 20s. of rent per arable acre, including hill grazings, which carry, on an average, 2 cows, 1 stirk, and 10 sheep; or 1 horse, 1 cow, 1 stirk, and 10 sheep. About two-fifths keep a small horse or pony. As a rule, the crofts are well cultivated, and the crops grown are about the same as indicated by the returns of 1853. The cattle kept by the crofters are generally black highlanders, and the sheep mostly crosses between blackfaces and Cheviots. Generally speaking, crofters' houses are in fair condition, most of them very comfortable. They have been greatly improved during the past twenty-five years. In later years a considerable number of the crofters have themselves built new houses, from 37 to 40 feet long by 13 feet inside the walls. The Duke of Sutherland supplies them with timber and lime free of charge, and also grants slates to be paid in certain instalments. The Duke also gives the crofters lime gratis for repairing their houses. In most of the townships the land has been reclaimed by the original tenants, and, where they still survive, they enjoy the land at the nominal rent fixed between thirty and forty years ago. Every encouragement is given to enterprising and industrious tenants in improving their land. In some cases portions of the lot or additional land is drained and trenched at the cost of the proprietor, the tenant paying interest at the rate of 5 per cent. per annum. Crofters having a good hill stock and a fair sized lot, or arable extent, maintain themselves without labouring from home. The greater number, however, after laying down the crops, seek employment wherever it is to be had; but the early and late herring fishings, especially the latter, are the great attraction. They seem to prefer to run the risk of fishing on chance to steady wages on land. Some seasons they do very

well, and in others they return with light purses, perhaps occasionally a little in debt. In the townships near the sea, with convenient creeks or landing-place for boats, the men are engaged less or more in the white and lobster fishing.

Labour and Markets.

Labour.—Ploughmen receive higher wages than in either Caithness or Ross; and during the past twenty-five years they have advanced nearly 80 per cent. They are engaged for twelve months, and receive in money and perquisites from £40 to £45 per annum. Most farms are provided with good cottages for married men. Single men, forming perhaps the majority, live either in kitchens or bothies, or with married servants. There are few bothies, but where they do exist, a respectable female servant is engaged to cook and keep house for the men. Women servants get from £8 to £10 a-year with board and lodging. The increase in their case is even greater than in that of ploughmen's wages. The Duke of Sutherland's land reclamations raised the wages of day labourers to from 3s. to 3s. 6d., in some cases to even 4s. a-day; but they have now fallen to from 2s. 6d. to 2s. 8d. per day.

Shepherds are generally married, and live in cottages near or on their "hirsels." On most farms there are a few single lads or men who board with the married shepherds. Sutherland shepherds are, generally speaking, paid higher wages than those in any of the other northern counties. On some farms, married men receive from £18 to £24 a-year with an enclosed croft of about 2 arable acres, keep for 18 to 24 sheep and 2 cows, and 6½ bolls of oatmeal; and single lads from £20 to £22 with board with married men, and keep for 12 sheep. On other farms married men get about £28 with small croft,—keep for 2 cows and a pony, and 6½ bolls of oatmeal. On an average, the money value of all they receive may be estimated at about £55 per annum. The shepherds' wages in the county have advanced from 15 to 30 per cent. during the past quarter of a century.

Markets.—Sutherland sheep are generally sold, by reputation, at the Inverness Wool Fair, held in the second week of July. Generally, farmers express satisfaction with their experience of that great fair, but some think that now, when the railway system is so complete, monthly or other periodical markets at the Muir of Ord or elsewhere, might advantageously take the place of the wool fair. The system pursued at the wool fair is certainly very peculiar and scarcely business-like. It has been well described by the late Mr Patrick Sellar:—"At this great market farmers assemble from all parts of the Highlands. They are met by wool-staplers and sheep-buyers from the south of

Scotland and Yorkshire, and transactions to a very great amount take place without show of stock or sample, resting entirely on the character held in the market by the owner and his goods." Such a system of selling goods of any kind can hardly be regarded as the best that could be conceived, though disputes about transactions made at the market are almost unknown.

Cattle and sheep markets are held at different times throughout the year, at Kyle of Sutherland, Golspie, Helmsdale, and Farr.

Subordinate Industries.

On the extension of the Highland Railway to Brora the Duke of Sutherland re-opened the coal-pit at Brora, which had been worked about seventy years before. The pit has been worked constantly since then, and, at present, the output is about 5000 tons per annum. The quality of the coal has been very much improved by a change in the mode of working. There is a band of stone in the centre of the seam, which necessitates a careful method of mining in order that the stones may be removed after the coals are loosened down on the face. The former method of working was what is known as the "wall-and-pillar" system, but the "long-wall" has now been adopted. There is, however, considerable difficulty with the new system by spontaneous combustion of what is known as the "Gob." The price of the coal at the pit has been reduced from 12s. 6d. to 8s. The demand is not half equal to the supply, and is entirely local. The Duke allows no coals to be used in Dunrobin Castle excepting those from his own pit at Brora. It contains a considerable quantity of sulphur, and in power is considered to be a third below the best quality of Scotch coal.

The large brick and tile works, erected at Brora a few years ago by the Duke of Sutherland, are still worked at full force. They are under the same management as the coal-pit. The clay is of a kind that is expensive to reduce, but still a large produce is kept up. The number of bricks and tiles made last year was 686,278. As formerly indicated, His Grace has established a large steam carpentry at Brora, where the fittings for all buildings in connection with the estate improvements are made. At His Grace's various works at Brora about 90 people are employed. The Duke has also in contemplation the erection of a woollen factory, for the purpose of manufacturing the famous Sutherland Cheviot wool into tweeds, as also with the view of giving work to the increasing population of the Brora district.

The discovery of gold in the drift of the Kildonan river some ten years ago, created great commotion in the north of Scotland. The intelligence of the discovery spread at telegraphic speed all over the country, and thousands of people, from all parts of the kingdom, flocked to the newly-found gold field. A "city of

tents" was erected in the centre of the auriferous district, "claims" were allotted and "cradles" mounted, and digging was commenced with much enthusiasm. At the outset a fair return was obtained, but it soon began to fail, and having become unremunerative the Duke of Sutherland closed the "claims" and dispersed the diggers. The total value of the gold found was about £6000.

Helmsdale is the only herring fishing station in the county. It sometimes can boast of a pretty large fleet. In 1867 45,302 barrels of herring were cured at it; while 3283 people were employed in connection with the fishing. In 1877 the number of boats fishing at Helmsdale was 196; the number of fishermen and boys employed, 704; the number of fish-curers, 19; the number of coopers, 55; the value of the boats, £4225; the value of the nets, £12,200; the value of the lines, £1197;—total value, £17,622. The number of barrels of herring cured, 2047. The number of cod, ling, or hake taken, 20,312.

Clynelish is the only distillery in the county. It is not large; but the whisky is widely celebrated. It is kept at work about twenty-five weeks in the year, and during that time it distils between 1300 and 1400 quarters of barley, or a little over 50 quarters each week.

EXPERIMENTS WITH SOLUBLE AND INSOLUBLE PHOSPHATES AND NITROGEN ON THE GROWTH OF TURNIPS.

By Thomas Lawson, Sandyford, Kirriemuir.

[*Premium—Five Sovereigns.*]

In 1876 the Aberdeen Agricultural Association surprised Scottish farmers by the publication of a pamphlet, detailing the results of a series of experiments on the growth of turnips, to test the comparative values of soluble and insoluble phosphates of lime and nitrogen as fertilizers for that crop. The results of these experiments, as conducted by Mr Thomas Jamieson, the chemist of the Association, evidently showed that insoluble phosphate, from whatever source it was derived, whether animal or mineral, in comparison with soluble, was almost equally valuable as a fertilizer if ground down to a fine powder. This revolutionary theory, though very favourable in a financial point of view for farmers, was generally received by them with great distrust, on account of its being totally opposed to all pre-conceived ideas of the comparative values of these manures. The inquiries of the Aberdeen Association during the next two years, 1877 and 1878, also tended to strengthen and confirm the first year's results. The Highland and Agricultural Society of Scotland instituted a

series of experiments, on a large scale, in the Lothians in 1878, conducted by their chemist, Dr Andrew P. Aitken. A partial report of the results of these experiments appear in the Society's annual volume of "Transactions," 4th series, volume xi., which, so far as it goes, points apparently in the same direction as the results of the Aberdeen experiments.

I, like the general bulk of farmers, had been accustomed to look upon undissolved mineral phosphates as worthless for manurial purposes, until treated with sulphuric acid. The results of the Aberdeen experiments were therefore at first taken by me, as also by the general agricultural community, with a considerable grain of salt, but the confirmatory proof of the experiments of subsequent years, as also the unmistakable leaning of Dr Aitken in the same direction, determined me to try the question fairly on soil in ordinary rotation for turnips. The piece of soil which I selected is a light gravelly soil, from 6 to 8 inches deep, overlying the Old Red Sandstone, and not naturally of a very productive character. It is about 270 feet above sea level, and thoroughly drained. The mode of cropping which has been followed in this field is the ordinary five-shift (2 grain, 2 grass, and 1 green crop), in which rotation it has been wrought for upwards of thirty years. The usual rule observed on the farm is to make one half of the fallow break potatoes and turnips alternately, thus it is ten years since turnips were grown on this portion of the field. Eight years ago it received about 3 tons of lime per acre. Five years ago it was regent potatoes, grown with farmyard manure fresh from the yards. The next crop was wheat, which received a dressing of 20 tons per acre of town and farmyard manure mixed. The succeeding two years' grass was pastured by cattle and followed by a crop of potato oats. After the removal of the oat crop, the stubble got a close deep furrow in September 1878. During the ploughing the soil was in nice dry condition, and was allowed to lie in the plough furrow until the first week of May 1879, when it was harrowed, grubbed, and rolled ready for drilling. The portion of the field out of which I was to select an acre for the experiments, was drilled up on the 26th May—drills 27 inches apart. I may add that during the preparation and drilling of this part of the field, the soil, in point of condition, was all that could be desired. In selecting an acre for the experiments, I endeavoured, as far as the nature of the field would allow, to give all parts of the plot an equal chance of situation, soil, &c. The acre I selected consisted of 30 drills, 216 yards long, extending to within 92 yards of the one end and 16 yards of the other end of the field. There were also turnips in ordinary cultivation on either side of the plot, as well as on the continuation of the drills at each end of it.

These 30 drills I subdivided into four equal parts, making four

sections of 30 drills 54 yards long, containing 1 rood each. These subdivisions were marked off by pins, so as not to interfere with the manuring and sowing of the turnips, the whole length of the drill being covered in by the plough, without turning the horses, after the different manures had been applied.

The first and second sections I devoted to artificial manure alone, and had the drills of these partially harrowed down with circular harrows to keep the manure nearer the surface, so as to be within easy reach of the young plants.

To the third and fourth sections I gave at the rate of 20 tons an acre of well-made farmyard manure. The artificial manures applied to these sections were sown broadcast on the top of this, after the farmyard manure had been spread. All the various manures were applied on the morning of the 28th May 1879, and immediately afterwards covered up by the plough. The turnip seed (M'Combie's yellow, supplied by Messrs Roughead & Park of Haddington), was sown a few hours afterwards amongst a moderately dry pulverised soil, at the rate of about 2½ lbs. per acre. Before proceeding to describe the applications to the various plots, I have to mention that the manures had been all carefully analysed previous to application, and that I personally calculated the weights, and superintended the weighing and application of the manures.

Section I. I devoted to testing the difference between soluble and insoluble mineral phosphates, also bone meal and dissolved bones, all in comparison with the natural production of the soil. For this purpose I subdivided the section into 6 plots of 5 drills each, equal to one-twenty-fourth of an acre. In applying these manures, each plot got the same weight per acre of phosphates, irrespective of source or solubility. The subjoined table shows the amount of each ingredient applied, and the cost and weight per acre—

SECTION I.

	Mineral Phosphates insoluble.	Mineral Phosphates soluble.	Animal Phosphates insoluble.	Animal Phosphates soluble.	Nitrogenous compounds = to Ammonia.	Weight per acre applied.	Cost per acre.		
	lbs.	lbs.	lbs.	lbs.	lbs.	cwts.	£	s.	d.
Plot 1	280	—	—	—	—	4⅕	1	1	4½
„ 2	280	—	—	—	—	8⅗	0	18	9
„ 3	—	—	280	—	22½	5	2	0	0
„ 4	—	280	—	—	—	8⅓	1	17	6
„ 5	—	—	140	140	23½	7	2	9	0
„ 6	No manure.								

The manures applied to these plots were as follows:—Plot 1 was 50 per cent. coprolites, finely ground; plot 2 was 30 per cent. French mineral phosphates, also finely ground; plot 3 was bone meal well ground, containing 50 per cent. of phosphates and 4 per cent. of ammonia; plot 4 was 30 per cent. soluble phosphate from coprolites; plot 5 was dissolved bones containing 36 per cent. of phosphates, half soluble half insoluble, and 3 per cent. of ammonia; plot 6, of course, got nothing but the seed.

Section II. was used for two purposes, the first two plots being to test potash along with insoluble and soluble mineral phosphates. The other four plots were devoted to testing an equal quantity of nitrogen, from as many different sources, along with an equal quantity of insoluble mineral phosphate, applied with each. The subjoined table gives the weight of each ingredient, as applied per acre, with total weight and cost:—

SECTION II.

	Insoluble Mineral Phosphates.	Soluble Mineral Phosphates.	Insoluble Animal Phosphates.	Sulphate of Potash.	Nitrogenous compounds = to Ammonia.	Weight per acre applied.	Cost per acre.
	lbs.	lbs.	lbs.	lbs.	lbs.	cwt.	£ s. d.
Plot 1	280	—	—	112	—	6¼	1 13 4½
„ 2	—	280	—	112	—	10¾	2 9 6
„ 3	280	—	—	—	27	5¼	1 19 4½
„ 4	280	—	—	—	27	5¾	1 18 0
„ 5	280	—	39	—	27	7¼	2 6 1½
„ 6	280	—	—	—	27	6	1 17 10½

Plot 1 was coprolite finely ground with sulphate of potash, containing 50 per cent. sulphate; plot 2 was mineral superphosphate, with sulphate of potash also; plot 3 was coprolite with sulphate of ammonia; plot 4 was coprolite with nitrate of soda; plot 5 was coprolite with fish guano, containing 9 per cent. of ammonia and 13 per cent. of phosphates; plot 6 was azote guano (or horn-and-hoof powder), containing 16 per cent. of ammonia, also with coprolites.

Section III. got an application of at the rate of 20 tons of dung to the acre, and also each plot received the same quantity of mineral phosphates. The intention of the experiments with this section was to test the value of nitrogen from various sources and in different quantities, as applied along with the farmyard manure and coprolites. The weights per acre of the various manurial ingredients and their cost are as under. I refrain from putting a value on the farmyard manure, as the basis of all the plots are equal—

SECTION III.

	Farmyard Manure.	Insoluble Mineral Phosphates.	Insoluble Animal Phosphates.	Nitrogenous compounds = to Ammonia.	Weight per acre.	Cost per acre.
	tons.	lbs.	lbs.	lbs.	cwts.	£ s. d.
Plot 1	20	280	—	13½	5	1 10 4½
„ 2	20	280	—	27	5½	1 19 4½
„ 3	20	280	—	13½	5½	1 9 1½
„ 4	20	280	—	27	5¾	1 17 10½
„ 5	20	280	39	27	7¼	2 6 1½
„ 6	20	280	—	27	6	1 17 10½

The source of the ammonia applied to plots 1 and 2 was sulphate of ammonia; plots 3 and 4 was nitrate of soda; plot 5, fish guano; and plot 6, azote guano; the farmyard manure and coprolite, as already mentioned, being the same on all the plots.

Section IV. was set aside for testing the same manures which were used in Section I., but along with them it received at the rate of 20 tons of farmyard manure per acre, but instead of having two coprolite plots there was only one, the other one getting fish guano alone. One of the plots received the dressing of farmyard manure alone, so as to have a fair comparison of the values of the various kinds of phosphates and nitrogenous compounds, as fertilisers for the turnip crop, in addition to ordinary farmyard manure. The subjoined table shows the weight per acre of the various manurial ingredients, and cost of same, excepting the farmyard manure, about the value of which there might be diversity of opinion—

SECTION IV.

	Farmyard Manure.	Insoluble Mineral Phosphates.	Soluble Mineral Phosphates.	Insoluble Animal Phosphates.	Soluble Animal Phosphates.	Nitrogenous compounds = to Ammonia.	Weight per acre.	Cost per acre.
	tons.	lbs.	lbs.	lbs.	lbs.	lbs.	cwts.	£ s. d.
Plot 1 .	20	280	—	—	—	—	4½	1 1 4½
„ 2 .	20	—	—	66	—	49	4½	2 0 6
„ 3 .	20	—	280	—	—	—	8½	1 17 6
„ 4 .	20	—	—	280	—	22½	5	2 0 0
„ 5 .	20	—	—	140	140	23½	7	2 9 0
„ 6 .	20	No artificial manure.						

The origin of the manures applied to the above plots were—plot 1, ground coprolite; plot 2, fish guano; plot 3, superphosphate; plot 4, bone meal; plot 5, dissolved bones; plot 6, farmyard manure alone.

As I intend to compare, both in growth and ultimate yield, the turnip crop immediately adjoining the experimental plots on all sides, it is necessary to describe the manures applied to it. This crop got about 20 tons of farmyard manure, same as Sections III. and IV. of the plots. The artificial manure applied consisted of coprolite, superphosphate, Peruvian guano, azote guano, dissolved bones, and sulphate of potash. This mixture contained barely 3 per cent. of ammonia, 26·20 per cent. of phosphates, about half soluble and insoluble, and 6·30 of potash, at a cost of about £6, 8s. per ton. About 7 cwt. per acre of this mixture was applied over the dung at a cost of about £2, 4s. 11d. per acre. The 5 acres contained in the piece were sown the same afternoon, and brairded about equally; but the fly attacked the north side of the piece from end to end, including almost the whole of Nos. 1 and 2 plots of all the sections. The plants in the other four plots of each of the sections came away healthy, and were thinned at the same time as those in ordinary cultivation outside the plots; there was diversity in the size of the plants when thinned, but not to such an extent as to call for special notice. Those in the plot with no manure were notably smaller, and not so healthy looking as the others when thinned. The fly-bitten plots, 1 and 2 of all the sections, were a week later in coming to the hoe, with the exception of plots 1 and 2 of Section I., which were three weeks later and barely sufficient plants. The 1 and 2 plots of the other sections, as well as those in ordinary cultivation, were as badly bitten with the fly as plots 1 and 2 of Section I., but they started to grow earlier, and had comparatively few blanks when hoed. On the other hand, the coprolite plots of the first section showed an unmistakable slow start.

I carefully examined the various plots on the 1st August, and found them as follows:—

Section I. plot 5, the dissolved bones leading, followed by the superphosphate and bone meal, which were about equal. The coprolite plots, 1 and 2, were about equal with no-manure plot, which was thinned three weeks earlier, but had almost remained stationary after that operation. In appearance the coprolites and bone meal plots looked healthiest, whilst among the turnips of the superphosphate and dissolved bone plots, some of the leaves were beginning to show an unhealthy green with a yellow curl at the tips.

In Section II., plot 5, fish guano led easily; plots 3 and 4, sulphate of ammonia and nitrate of soda made good seconds;

whilst the azote guano and the potash plots, 1 and 2, were about equal. The potash plots were very much ahead of the coprolite plots of Section I., a fact which I no sooner discovered than I had a consultation with Mr J. Falconer King, Edinburgh, and told him that on soil which he had previously analysed ·25 per cent. of potash, the addition of potash to the soil had a very marked effect on the growth of the turnip plant. He thereupon asked me to take a sample of soil out of plot 6, section I., which had received no manure, which I did, and sent to him for examination, when he reported that the soil contained fully ·25 per cent. of potash, but that it existed in such a condition that only about ·04 of it was in a state to be immediately available for the use of the plant.

In Section III., plot 5, fish guano was first, plots 3 and 4 made good seconds, plots 1 and 2 being a little behind these, while plot 6, azote guano, looked worst.

In Section IV. there was very little diversity in the appearance of the plants. Plot 5, dissolved bones divided the honours with plot 2, fish guano. Plots 3 and 4 were about equal, and plots 1 and 6 were also about level, and a little behind. The turnips in ordinary cultivation were ahead of any of those in the plots.

I examined the plots again on the 1st September and found a considerable difference. In Section I. the dissolved bones and superphosphate plot showed to a much greater extent the unhealthy green and yellow curl of the leaf, to which I have already alluded; in fact, several blotches in both plots had deteriorated instead of having improved during the month, and they looked anything but a healthy or a level crop. The bone meal plot seemed to be leading in point of vigour, and the mineral plots pulling hard at their leeway. The no-manure plot still looked worst, but no unhealthy curl on the leaves. In Section II., the four plots which had got nitrogen looked bulkiest in the shaws and apparently about equal. The potash looked very well, but not so big shaws as the nitrogen plots, and still a great way ahead of the coprolite plots of the first section. In Section III. the order of things, as existing on the 1st August, was almost entirely reversed. The azote guano plot had improved immensely; its leaves were by far the largest and most vigorous of any in the section, but the roots at that date were not quite so good as some of the others. The other five plots looked pretty much the same, the fish guano plot being if any thing better rooted than the others. In Section IV. the no artificial manure plot was still worst. The others occupied pretty much the same position as they did a month previously. At this stage, 1st September, some thin spots of soil were shown by the turnip on them getting a little faded in the leaves. This

change was more marked by 1st October; but, otherwise, there was little alteration in the appearance of the relative positions the plots occupied a month earlier. Owing to blanks in some of the plots, I could not well give a fair comparison by pulling and weighing the whole plot, and the thin spots of soil, predominating more in some plots than others, would have also been against a fair average. I therefore chose a portion of the three central drills of each plot, apparently grown on average soil, extending collectively to the length of one whole drill of a plot, or the $\frac{1}{120}$th part of an acre; by doing so I was enabled to fill up any blank in the piece weighed by an average turnip out of the adjoining drill. I then got rid of any extra thin or deep pieces of soil, and also avoided weighing any of the outside drills, where the manures of the neighbouring plots may have been slightly overlapped. I procured the assistance of one or two practical gentlemen, and we bestowed the greatest attention on the selection of the pieces weighed, and also in the shawing and weighing of the roots and shaws. The subjoined table shows the weights of the various plots immediately after being pulled.

	Nos. of Plots.	Total Weight of Roots per acre.			Total Weight of Shaws per acre.			Total Weight per acre.		
		tons.	cwts.	lbs.	tons.	cwts.	lbs.	tons.	cwts.	lbs.
Section I.	1	9	18	24	5	12	66	15	10	90
...	2	9	18	24	4	17	56	14	15	18
...	3	11	6	8	5	15	0	17	1	8
...	4	10	2	56	6	0	0	16	2	56
...	5	8	3	104	5	7	16	13	11	8
...	6	7	13	24	3	15	4	11	8	28
Section II.	1	14	15	20	6	15	0	21	10	20
...	2	15	11	98	6	17	26	22	9	12
...	3	14	5	0	8	7	16	22	12	16
...	4	15	2	26	8	5	0	23	7	26
...	5	16	19	72	7	15	0	24	14	72
...	6	15	15	0	5	1	88	20	16	88
Section III.	1	16	10	0	6	2	26	22	12	26
...	2	17	14	72	7	3	64	24	18	24
...	3	16	19	72	7	14	32	24	13	104
...	4	18	5	40	8	5	0	26	10	40
...	5	21	2	16	8	8	34	29	10	50
...	6	22	5	80	7	4	75	29	10	43
Section IV.	1	16	3	64	6	14	32	22	19	98
...	2	19	2	56	6	6	48	25	8	104
...	3	17	9	32	6	0	0	23	9	32
...	4	16	2	16	5	7	16	21	9	32
...	5	17	2	96	5	14	72	22	17	56
...	6	15	10	80	4	17	56	20	8	24
Ordinary crop	—	26	8	24	7	18	64	34	6	88

The turnips were pulled and weighed on the 28th October. The soil was very dry, and the turnips were almost as clean and free from soil as if they had been washed, all the very small rootlets were struck off, and the shaws were separated from the root close to the bulb. Before making any remarks on the general results of the experiments and their effect on the question at issue, I will tabulate the exact weight of roots and shaws grown on each plot of the first and second sections, exceeding the natural production of the soil, as shown by plot 6, Section I., also giving the cost of the manure per acre which grew the said excess.

	Nos. of Plots.	Excess Weight of Roots.			Excess Weight of Shaws.			Cost per acre.		
		tons.	cwts.	lbs.	tons.	cwts.	lbs.	£	s.	d.
Section I.	1	2	5	...	1	17	62	1	1	4½
...	2	2	5	...	1	2	52	0	18	9
...	3	3	12	96	1	19	108	2	0	0
...	4	2	9	32	2	4	108	1	17	6
...	5	0	10	80	1	12	12	2	9	0
Section II.	1	7	1	108	2	19	108	1	13	4½
...	2	7	18	74	3	2	22	2	9	6
...	3	6	11	88	4	12	12	1	19	4½
...	4	7	9	2	4	9	108	1	18	0
...	5	9	6	48	3	19	108	2	6	1½
...	6	8	1	88	1	6	84	1	17	10½

The excess of weights above the net production of the soil show, in the first place, that coprolite, or ground mineral phosphates, do increase the weight of crop, but, owing to the sluggish start which it gives to the plant, it exposes it to the ravages of all the parasites which prey on its leaves, at a stage of its growth when it most requires nourishment, and is not, therefore, suitable on poor soils, or safe to apply alone as a turnip fertilizer, especially if followed by cold or ungenial spring weather. Also, that soluble mineral phosphate increases the crop to a greater degree than insoluble, giving it a quicker start and allowing less chance for the operations of all destructive parasites which prey on the plant during its early stages, it being very questionable, however, whether the dissolving of the phosphates is worth the expense of the operation, as a little nitrogen at half the expense would give the same result.

Animal phosphates, in the shape of bone meal, give the best results of this section, being better than either soluble or insoluble phosphates from mineral, but the cost is nearly double that of raw mineral phosphate, and although it contains a considerable weight of nitrogen, better results are obtained at the same expense by applying the nitrogen in a different form for turnips.

The dissolved bones is the most disappointing plot of all, giving the worst returns for the largest expenditure, and containing, as they do, equal proportions of soluble and insoluble phosphates, and also a fair quantity of nitrogen, in proof of which the plants came away quickly at first, and became unhealthy only at an advanced stage of their growth. The dissolved phosphate in plot 4 exhibited the same unhealthy state amongst the turnip plants. I can see no reason for it, unless there might have been an excess of sulphuric acid or some deleterious substance in the manure. As the no-manure plot alongside was quite healthy, the cause, therefore, could not be in the natural condition of the soil. In Section II., the addition of sulphate of potash to ground mineral phosphates, produces fully three times the excess of weight of the coprolite alone, and, in the case of potash and superphosphate, as compared with the soluble phosphates alone, also shows three times the excess weight of roots, both showing a corresponding increase of shaws in comparison to the roots. The soluble phosphate here again takes a slight lead, but barely sufficient to cover the extra cost of the manure. Nitrogen added to coprolites clearly shows a large increase of crop, both roots and shaws, but certainly an excess of the latter as compared with the potash plots, more especially the sulphate of ammonia and nitrate of soda plots. The fish guano plot looked very well all along, and rooted earlier than the sulphate and nitrate plots. The azote guano plot came away at first the worst of all four, but made up its lee-way rapidly at the end. The extra wet season may account for the more soluble salts of sulphate of ammonia and nitrate of soda being beaten in results by their less soluble neighbours, fish and azote guanos. As they would be more readily washed away into the drains in such a porous soil, a drawback to which the guanos were not very much exposed, the nitrogen in them being in combination with animal matter instead of in a soluble salt. Judging from the results of these experiments, it is quite clear that in such a season, and on the kind of soil to which I have already referred, the most economical manure for the growth of a bulky crop of turnips, would be ground phosphates, with the addition of the sulphate of potash and a little nitrogen in a convenient form to stimulate the plant during its early stages. I am very sorry I did not try that mixture, but the results of the potash plots were such as to astonish me. Had I been aware of the value of that salt as a fertilizer, I would certainly have tried it along with nitrogen and phosphates. I have used that mixture above farmyard manure, to which I shall have occasion to refer presently.

I shall now show in tabulated form the extra weight of turnips grown by addition of various compounds of phosphates and nitrogen to farmyard manure, in each case deducting the weight

of turnip grown on plot 6. Section IV., which received nothing but farmyard manure alone, thus giving the excess weight of roots and shaws separately over the weight of that plot.

	Plots.	Excess Weight of Roots.			Excess Weight of Shaws.			Cost of Manure per Acre.		
		tons.	cwt.	lbs.	tons.	cwt.	lbs.	£	s.	d.
Section III.	1	0	19	32	1	4	82	1	10	$4\frac{1}{2}$
...	2	2	3	104	2	6	8	1	19	$4\frac{1}{2}$
...	3	1	8	104	2	16	88	1	9	$1\frac{1}{2}$
...	4	2	14	72	3	7	56	1	17	$10\frac{1}{2}$
...	5	5	11	48	3	10	90	2	6	$1\frac{1}{2}$
...	6	6	13	0	2	7	19	1	17	$10\frac{1}{2}$
Section IV.	1	0	12	96	1	16	88	1	1	$4\frac{1}{2}$
...	2	3	11	88	1	8	104	2	0	6
...	3	1	18	64	1	2	56	1	17	6
...	4	0	11	48	0	9	72	2	0	0
...	5	1	12	16	0	17	16	2	9	0

The excess of the plot weighed from the general crop, which received potash, nitrogen, and phosphates in addition to the farmyard manure was—roots, 10 tons 17 cwt. 16 lbs.; shaws, 3 tons 1 cwt. 8 lbs., being nearly double the surplus of any of the plots in either section, and grown at a cost of £2, 4s. 10d. per acre. The source of the nitrogen in the general crop would be principally from Peruvian guano and azote guano. The nitrate of soda and sulphate of ammonia give very even results; the half and whole quantity of each applied give corresponding results in the increase of crop. This time the azote guano divides the honours with the fish guano, both being again better than the salts of ammonia and nitrate of soda. Coprolites or ground phosphate alone produces barely 13 cwt. of roots more per acre than the farmyard manure; while superphosphate shows a surplus of $38\frac{1}{2}$ cwts., thus again beating its opponent, the insoluble, by a short way.

Fish guano by itself, added to the farmyard manure, gives the best results for the money in Section IV.; dissolved bones giving barely half the surplus weight of the fish guano plot. Bone meal has turned out no better than the coprolites, as applied above farmyard manure, in regard to weight of turnip crop. In glancing at the results of the experiments with these various artificial manures, and mixtures of them, as applied above farmyard manure, it is at once apparent that the addition of nitrogen increases the crop to a considerable extent; while insoluble phosphates do increase it, but only to a very limited extent,—soluble phosphates increasing the crop still further than insoluble, but neither of them doing so to an extent that would warrant their economical use above the quantity of dung I have

applied with them. I refer only to those plots where no nitrogen was applied with the phosphates.

I quite believe that, had the season been moderately dry instead of excessively wet, the soluble salts of ammonia, and also the soluble phosphate of lime, would have given better results; and in looking at the results of these, that must be taken into consideration. A fact proved by the experiments is—that in the application of phosphates, the finer the state of division, the more quickly and effectively will they act in stimulating the plant.

The bigger yield of the general crop outside the plots I attribute partly to the Peruvian guano and partly to the potash. The Peruvian guano was in a much finer state of division than either of the other guanos, therefore the ammonia and nitrogen contained in it was in a state to be more readily assimilated by the plant, thus giving it a quicker and a stronger start. But, judging from the results of the two potash plots of Section II., the potash in the mixture also deserves a considerable share of the credit for the growth of the additional crop, although the quantity used was not quite so large as that in the plots to which I have referred. The results of Sections III. and IV. show that the nitrogen and ammonia contained in the guanos have given the best results; and the addition of potash to these, as in the general crop, have apparently further improved these results; but in different seasons, even on similar soil, the results might vary considerably.

In reference to the Aberdeen and Lothian experiments, to which I alluded at the beginning of this report, the soil on which I have conducted these experiments is different from any of these,—being, as I have already stated, Old Red Sandstone gravelly drift; and, though naturally a very poor soil, is in a good fair state of cultivation, and owing to the rotation which has been followed, is in a condition to give good results in the growth of turnips. In the face of a very cold, wet, and ungenial season, and as compared with the natural produce of the soil, the application of the various chemical manures used has brought out the following facts—*first*, that soluble phosphates grow a bigger crop than insoluble, but barely to the extent of covering the difference in the cost of the two manures; *second*, that the addition of potash along with either soluble or insoluble phosphates very materially increases the bulk of crop; *third*, that the addition of nitrogen to insoluble phosphates increases the crop to an extent a very little beyond that of potash. In the use of chemical manures along with farmyard manure, the following facts are disclosed—*first*, that the addition of insoluble phosphates produces very little addition of crop; *second*, that soluble phosphates increase the production more than the insoluble, but that neither the one nor the other do so to such an

extent as would warrant their economical use alone above farmyard manure; *third*, that the addition of nitrogen increases the crop to a considerable extent, while the addition of potash and phosphates to the nitrogen increases the weight of crop still further,—all these manures combined producing a surplus of crop over that of farmyard manure alone, far more than equivalent to the cost of these manures.

In reference to the diseased or unhealthy state of the turnips in the dissolved bone and superphosphate plots of Section I., I fortunately have still in stock a portion of the manures, from the bulk of which I had drawn the quantity for these plots. The manures were analysed by Dr Macadam of Edinburgh, during April 1879, who certified the one to be bones and acid; the other to be mineral phosphate and acid. I thought that it might be possible that the manures may have contained some poisonous matter, after seeing the condition of the turnips during the autumn months; I therefore drew a sample of the dissolved bones in October, and sent it to J. Falconer King of Edinburgh, with minute instructions to test for poisonous matter. He duly reported that he had carefully analysed and tested the manure, and found no trace of any substance in its composition which would prove injurious to plant life. This report, while very satisfactory to the manufacturers of the manure, leaves me quite as much in the dark as ever in regard to the cause of the unhealthiness of the turnips. The only cause which looks feasible may be an excess of sulphuric acid in the soil, seeing that the plots treated with the manures containing it were the only unhealthy ones. In regard to the quality of the turnips grown by the various manures, I thought it necessary only to test those turnips grown on the plot with no manure; also those on the superphosphate plot, the nitrate of soda and coprolite combined plot, the farmyard and artificial manure combined from the general crop of the field. All these turnips being of the M'Combie's Aberdeen yellow species, I judged it prudent also to test the Swedish turnips of another portion of the field. I gave the chemist to whom I sent the turnips, instructions to ascertain the quantity of water only contained in the composition of the turnips. I pulled average turnips out of each of the divisions to which I have referred—as nearly as possible about the same size—and subjoined are the results:—

	Percentage of Water.
No-manure plot—Yellow turnips . . .	89·50
Superphosphate „ „ . . .	88·24
Nitrate of Soda and Coprolite—Yellow turnips	92·12
Farmyard and Artificial „ „ .	89·70
Swedish turnips .	88·39

In passing a remark on the results of these analyses, I may mention that I would have liked very much to have tested the solidity of some of the turnips from the other plots also, but refrained from doing so on the score of expense. The superphosphate apparently gives the best results in point of quantity of solids, and the Swedish turnips are much the same; while farmyard manure, with phosphates, potash, and nitrogen combined, gives similar results to the no-manure plot, the nitrate of soda (plot 4, Section II.) always showed a great abundance of shaws, and evidently the roots stand lowest in point of solids. There is no use of attempting to generalise on these analyses, as, to have afforded fair scope for doing so, there should have been turnips taken out of every one of the plots and examined; but the results of what has been done will afford a fair criterion of the quality of the turnips in those plots, and also the position yellow turnips hold in comparison to Swedes as regards the amount of their solids.

The readers of this report may rest assured that everything which has been done in connection with these experiments has received every care and attention, having been done solely with the purpose of ascertaining the actual values, as fertilizers, of the various manures used.

IMPROVEMENTS ON THE ESTATE OF DENBRAE, FIFESHIRE.

By David Watson Wemyss, Newton Bank, St Andrews.

[*Premium—The Gold Medal.*]

The Highland and Agricultural Society, always ready to promote and improve the agricultural interest, having offered a premium for an approved report by the proprietor, in Scotland, who shall have executed the most judicious, successful, and extensive improvement on his estate, I take the opportunity to give a description, as accurately and distinctly as I can, of improvements which were executed and carried out under my own personal superintendence, on a property belonging to my father and myself jointly. In 1858, my father being unable, through old age, and not residing on the farm, to superintend the work himself, authorised me to make such improvements as I considered necessary and desirable.

This property, I may state, is a farm extending to about 300 imperial acres, 200 of which are arable, 80 rough pasture, and 20 meadow and peat moss. The lands, which are mostly of good quality, have rather a northerly exposure, and a high elevation,

about 200 or 300 feet, consequently the crops are long in coming to maturity.

The lease of the farm expired in 1858, the tenant, who was then an old man, having occupied it for nineteen years. He being a farmer of the old style, did not keep sufficient force to work the land, consequently it got completely exhausted for want of manure, and overrun with weeds; the farm roads were getting impassable, and the fences falling out of repair, and the crops so bad that they were scarcely worth reaping. Seeing that the farm was in such a bad state, my father and myself agreed that it would be in vain to endeavour to re-let it before having it thoroughly improved. This I undertook to do, and to reside on the place until the work was completed, considering it my duty, and for our mutual advantage, to put the farm and buildings in good repair. I therefore took possession, and the farm was stocked with five pairs of excellent horses, and implements of modern principle, and as many cattle as the turnips and straw then on the farm would admit of, so as to make as much manure for the succeeding crop as possible. I remained there for eleven years, making the improvements, which I will now describe.

As a great deal of carting would be required, such as wood, lime, tiles, &c., for carrying out the necessary improvements, I considered the first thing most necessary to be done was to repair the road to the farm, leading off the high road, and about half a mile in length, it being almost impassable with holes and wheel tracks. A large quantity of stones, gathered off the land, had been allowed to accumulate for many years previous by the sides of the road; I immediately employed men to break them into rough metal, and as soon as a quantity was ready, the largest holes were filled up by degrees, and following the same course for at least twelve months, a good road was made, without requiring to give it a covering of metal all over. The expense of this was at least £40. A good footpath was made alongside of it, with engine ashes from coal pits in the vicinity, some of which were also used to cover the road metal where most required.

The next most necessary improvement was to drain the land, which was often a very difficult and arduous process. All the fields required to be gone over, nothing having been previously done in this respect, except a few stone drains, which were of little or no avail. I resolved to have this work done in a thorough and efficient manner, and took each field as was most convenient, until all were gone over, which covered a period of four years, the extent of ground being about 200 acres. Between 20 and 30 men were employed during that period, at suitable times, to cast the drains, at a fixed rate per chain of 22 yards. Two or three men were also specially employed on weekly wages to lay

the pipes, which I considered was the surest and safest way to have the work efficiently done, it being the most important part of it, and none of the drains were allowed to be filled in until I personally inspected them and gave instructions to that effect. It was first proposed that the drains be 3 feet deep and 6 yards apart, but after this was tried I found the subsoil was stiff clay, and thought that, if it could be penetrated, the drains would be of more advantage, so I resolved to cut a foot deeper; this being done, the subsoil was more open and water was come to, so the whole of the land was drained to the depth of 4 feet, and 8 yards apart, and laid with 2 inch pipes, the main drains being a foot deeper and laid with 4 inch and sometimes 5 inch pipes, when the fields were extensive. On the higher portion of the lands large boulders of whinstone rock interrupted greatly the casting of the drains, and I found it necessary to employ a man specially to blast them and take them out, which was often a difficult process. This, of course, incurred extra trouble and expense, but, had such not been done, the work would have been imperfectly executed. The cost was about £8 per acre, and the total sum expended was £1500. This outlay, taking interest at 5 per cent., was equal to £75 a-year, which, as I will afterwards explain, amply repaid itself by increase of rent.

The steading was greatly out of repair, and required considerable alteration and extension. The total cost for doing so was £1000, and the following were the principal improvements made. Before these were commenced, a cottage on the farm was fitted up for the workmen to live in, the nearest village being from 3 to 4 miles distant, and when one class of workmen finished it was occupied by another, until the work was accomplished, which was nearly two years.

The first place demanding attention was the stable, which incurred a good deal of expense. It was previously fitted up with fourteen stalls and a hay-loft above. These were all cleared away, and it was re-fitted with twelve stalls without any loft above,—the breadth of two stalls being taken off the end for a grass and hay shed, having a large door. The trevis posts were of round larch trees, about 10 inches in diameter; and the boards of foreign wood, 2 inches thick. The stalls were fitted up with cast-iron hecks and troughs. A new tiled roof, having six ventilators, was put on, the couples being of half white-wood battens, and the tile and plaster lath of the same wood.

The cattle court was next commenced. It was a large and open court partly enclosed with a small shed. A brick pillar was placed in the centre and a wooden beam on the top to support the roof, which then covered the whole. A wooden trough and straw heck was placed all round, and a large swing gate opening to the south, and a sliding door to the north.

The cattle byres were cleared out and re-fitted with stone troughs and trevis flagstones, 5 feet square. Iron bars were fixed at each side in front to attach the cattle bands to, each stall being constructed to hold two cattle.

A turnip shed was erected alongside of these byres, 20 feet wide, with a large sliding door at each end. The roof was supported on one side by the walls of the byres, the other side by brick pillars, 6 feet apart, with a wooden beam on the top—the space between the pillars being filled up with boards 1½ inch thick, and roofed with tiles. This was erected at little expense, and suited the purpose well.

The thrashing-mill, formerly one of the old principle and driven by horse-power, was cleared out, and a new one, on the English principle, direct from the makers, to thrash, dress, and clean the grain, was put in; and the old mill-shed was converted into an engine and boiler house. Although the expense of this was considerable, I consider it was a saving in the end, because as much grain could be thrashed and dressed in one day with it as in four with the old one; besides, the corn was cleaner thrashed, better dressed, and obtained a higher price in the market.

These additions and improvements on the steading lasted over two years; but, after being completed, a better and more convenient homestead could not be desired,—almost the whole of it being roofed over, and doors made, where convenient, to the cattle courts and byres, for the transmission of straw and turnips. The making of these improvements tended greatly to the subsequent letting of the farm. Had it been re-let before they were accomplished, a great deal more extra trouble and expense would have been incurred both to the landlords and tenant, and probably without giving satisfaction to either party. The cost of driving alone, including the drain tiles, could not be estimated at less than £200; which went a great way in carrying the improvements out, and was saved by the proprietors having it in their own hands.

All fields on the farm, extending from 10 to 25 acres, were enclosed with dry stone dykes, which were very much out of repair, and falling down from neglect. The worst and most needful of these were annually repaired by the ploughmen on the farm, when the field work was completed, or in weather when the land was not in a fit state to labour. In places where stones were required, those from the drains and fields were used for the purpose, and the smaller ones for road metal. In this way all the rubbish was made use of; and had it not been required for these purposes, an acre or two of ground would have been taken up to hold it.

After all these improvements were completed, and the driving

work over, a field of old rough pasture, extending to 15 acres, covered with whins and large stones, and which had never been cultivated, was reclaimed. The whins were first burnt, and the large roots taken out with mattocks; sometimes horse-power had also to be applied to extract them, and these were carted away and given to the farm labourers for firewood. The largest of the stones were blasted, and carted to the dyke-sides where they would be required. The field was first ploughed with a subsoil plough, drawn by three horses, to extract the smaller roots and stones; then it was gone over with a brake harrow, afterwards with common harrows, and rolled. At this stage it was allowed to lie until it was drained, which was done in the same way as the other fields. It was then cross-ploughed, harrowed, and rolled, then ploughed for seed, and sown with oats. The crop brairded very irregularly, and the return was small—only 4 bolls per acre; but, probably this was on account of the old turf not having sufficient time to rot, and no artificial manure having been applied. The following year it was ploughed once, and again sown with oats and 2½ cwt. of guano per acre. The return was almost double that of the previous year, or 7 bolls per acre. The year after, it was ploughed and grubbed several times, cleaned of weeds and stones, and sown with turnips, which were a very good crop; it was then limed, and cultivated in rotation along with the other fields. The expense of reclaiming this field, I consider, repaid itself in a few years,—the estimated rental of it in its rough state was about 15s. per acre, and it was subsequently let for 30s.

In almost every field on the farm large whinstone boulders, some of them partially covered with the soil, interrupted the ploughing very much, and damaged the implements as well as the horses. I therefore found it necessary to employ an extra man on the farm for several years to blast them, pick them out, and drive them away; which had often to be done by means of a harl, many of them being too heavy to cart, especially for one man. In a few years this made a great difference to the working of the land, and had a man not been specially employed for that work, it would never have been done.

All the arable land on the farm was completely overrun with weeds, and that intended for green crop in rotation had to be ploughed, grubbed, harrowed, and rolled at least three times, and the weeds gathered off, before a field could be sown; but it took a rotation of crops before it was thoroughly cleaned. The weeds, or rack as it is termed, were always carted to a heap and mixed with lime, then laid on the land previous to its being sown with barley and grass.

No wheat was grown on the farm for many years previous to my taking possession, the land being so wet that the young

plants were generally thrown out in winter. After getting the fields drained I attempted it, but not to a great extent at first, and the return was so good, to the surprise of many, that more and more was sown every year; and wheat was continued as one of the regular crops on the farm. Knowing that wheat could be grown on the land to advantage, it was the means of getting a much higher rent, when subsequently re-let, than it would otherwise have brought.

Being several miles from a railway station I never planted more potatoes than were required for farm use,—the land being kept in fallow instead, both to rest it and to clean it, which would have occupied too much time in spring to do thoroughly, so as to get them planted in time. This plan seemed to work very well; the loss of the crop was re-paid by the succeeding crop, which was always wheat, the ground being well manured, several times ploughed and cleaned, and the return was generally about 8 bolls per acre.

The permanent pasture fields, when I entered, were almost completely covered over with whins; but by degrees I got them greatly reduced by burning and digging them out. It was impossible to reclaim them, the surface being so uneven and beds of whinstone rock cropping up at intervals, with pools of water collecting in the hollows; but these were greatly relieved by casting deep drains. These fields all adjoined, but required shelter greatly; so a strip of plantation, about 10 acres in extent, was planted on the north and east sides of them, consisting of larch, spruce, and Scots fir, with a few oaks. They were planted very thick, and in a few years they formed a good shelter, and the cattle throve much better, and more valuable cattle could be grazed than formerly, which were generally Irish stirks. This plantation was enclosed with a paling where there was no wall, and open trenches cut across in the wet places, and a deep open ditch all along one side, which suited several purposes—namely, in keeping the plantation dry, a good supply of water to the pasture fields, and also an exit for some of the main drains of the other fields, without which they must have been much longer and deeper before getting an exit. In about ten years this plantation would repay itself, both in rent of land occupied and cost of planting, by the shelter it afforded, and by thinning out the firs, which were growing rapidly and which were suitable for many purposes connected with the farm.

The meadow, extending to about 7 acres, was annually cut for hay for the cattle in winter, it being too wet either to cultivate or pasture, and too level and low to drain. But I consider it was more profitable to have it as it was than any other way, as the crop was always good and made excellent fodder.

The moss land was always kept in pasture, but an open ditch,

4 feet deep and 3 feet wide, had to be made all round, and cleaned out every year to keep it dry, and to maintain an open exit for the trenches cut across the field. It was impossible to reclaim this sort of land,—at least, to be of any advantage; the subsoil being too soft to admit of tile-drainage, and too level to have sufficient tail, as the drains would soon become useless and fill up. For these reasons it was better to keep it in pasture.

Although the farm house was very much out of repair when I went to it, I resolved to put up with it until the other more necessary improvements were accomplished. These being done, the inside was completely cleared out and refitted. Two oriel windows were made, and a wooden porch erected at the front door; and a small piece of ground, surrounded with a wall, for a flower-plot. A lead pipe was brought from a deep well at the outside, and the water brought into the house by means of a force-pump, which was a great convenience.

Three new cottages for ploughmen were also erected, each having three rooms and a pantry, with coal house and pig styes at the back; the floors were laid with paving tiles, the walls lathed and plastered, and the roofs slated. The stones required for these and other building purposes were obtained from those blasted in the fields and drains, which was the best means of disposing of them, also saving a good deal of trouble and expense, which would have been incurred had these buildings been proceeded with any sooner.

Many other minor improvements were effected, but I think I have mentioned the principal works, which were all carried out under my superintendence, according to plans made out by my father and myself. The subsequent increase of rent obtained for the farm amply re-paid interest on outlay—the previous rent being £250 a-year; and after these improvements were finished, and the land drained and cleaned, it was let for £400—giving a rise of £150. The total sum expended was about £2500, so the increase of rent gave interest equal to 6 per cent., which was undoubtedly good interest for landed property.

I have often remarked that, if the previous tenant had remained two or three years longer, it would have been almost impossible to clean the land; and the cost of improvements, draining, &c., would have been much greater on account of the great rise in wages as well as materials. There was also more encouragement at that time to reclaim waste lands, the prices obtained for farm produce being much higher than they are now, and the agricultural interest being in a flourishing state —no signs of depression being then heard of, either caused by bad seasons or from foreign competition,—grain of good quality always commanding a ready market and a good price. It is to

be hoped that these prosperous times will soon return, and the agricultural interest revive and prosper; should it not, ruination both to landlord and tenant will probably be the result. It is very improbable that much waste land in this country will be reclaimed, or new farm homesteads built or extended beyond what is absolutely necessary, neither party having either the means or any encouragement to do so. The agricultural interest having become so depressed, and little sign of improvement, the value of land must certainly come down in price, to the great loss of the landlord.

ON THE CHEVIOT BREED OF SHEEP.

By David Archibald, Duddingston, South Queensferry.

[*Premium—Ten Sovereigns.*]

To many it may appear unfortunate that the Highland and Agricultural Society should have selected the Cheviot breed of sheep as one of their essay subjects in a year when the times are so depressed.

The season 1879, it is almost needless to say, will be remembered as one of the worst of the century. Regarding the springs of 1816, 1837, 1838, and 1860, there are accounts of great losses; and the year through which we have just passed will always be classed as nearly, if not altogether, equal in severity to any of these. Into any minute account of this year's storms it is, of course, not permissible to enter; but, at the same time, it is certainly worthy of being put upon record that, throughout the winter and spring of 1878–79, hand-feeding was in many places carried on by Cheviot owners for as many as twenty weeks, and that in the North the loss of a sum equal to two—and, in some cases, to three—rents of the farm will not be uncommon.

The development of the type of sheep named after the Border hills is a matter of less uncertainty than the origin of the breed. A consultation of most reliable authorities leads, however, to the belief that there were in the early days of pastoral farming a good many native breeds in different parts of Scotland, which were prevented from crossing, and so becoming one common variety, by the isolation in which they were then, of necessity, kept.

From one of these stocks, Cheviots are, it is safe to infer,

descended; any tradition as to their importation into the country being utterly unsupported by anything that is known. One very notable fact is that, in a reference to the agriculture carried on by the monks in the middle ages, Cosmo Innes, in his history of that period, devotes an entire paragraph to a description of the practice of the sheep-farming churchmen of Teviotdale. "The monasteries of Teviotdale," this writer says, "had necessarily a great extent of pasture land, and the minute and careful arrangement of folds in their mountain pastures for sheep, and byres for cattle, and of lodges or temporary buildings for their keepers and attendants, shows that they paid the greatest attention to this part of their extensive farming." "But," it is added, and the remark is suggestive of the lead which the Church then took in every matter, "the immense number and variety of agricultural transactions, the frequent transference of lands, the disputes and settlements regarding marches, the precision and evident care of leases, the very occurrence so frequently of names of field divisions and of boundaries between farms settled by King David in person, shows an enlightened attention and interest in agricultural affairs that seem to have issued from the monastery, and reached the whole population during the period of natural peace and good government which was so rudely terminated by the wars of the succession."

Just when this pleasant stage had been reached, and when most likely improvements were in progress which, had they been followed out, would have influenced considerably the after-history of Border stock breeding, the country was plunged into troubles and disorders, and people, deprived of security of possession, rapidly fell back into that comparatively degraded state out of which they had been elevated. From the time of Bannockburn till the Act of Union was passed at the beginning of the eighteenth century, the minds of Borderers were occupied only with schemes of depredation. One Border raid followed another as soon as plans of inroad or revenge could be matured: and as the live-stock possessions of the men on both sides of the boundary-line were often on the move from one stronghold to another, it was of course impossible that more could be done than keep the breed in existence. Of sheep there appears, indeed, to have been but a small number left in the district, for, in the plunder that one Borderer made from another, it is seldom that flocks are heard of,—the booty almost always consisted of herds of cattle, which were driven before the horsemen. At the beginning of the seventeenth century, on the union of the two crowns, some slight improvement took place, as appears from Lord Napier's "Treatise on Practical Store-Farming." It was not, however, till a feeling of security was restored by the

Act of Union in 1707 that pastoral prosperity returned; and, after a lapse of only forty or fifty years, the discriminating treatment of stock by a Roxburghshire farmer, Mr Robson of Belford, then led to a fair start being made with the development of the present variety of sheep. In working out his system of crossing, Mr Robson, as has before been indicated, undoubtedly used what were then the representatives of old native flocks.

What the characteristics of these were has been told by one or two authorities. Youatt, in his valuable volume on the sheep, says, that—"on the upper part of that hill in Northumberland, which is properly termed the Cheviot, a peculiar and most valuable breed of sheep is found, and they have been there from time immemorial. Tradition says they came from the border districts of Scotland; but they are totally different from the black-faced sheep, and bear little or no resemblance to the original dunfaced Scottish stock." Then, again, Professor Low, in his work on the "Domestic Animals of Great Britain," states that—"the Cheviot breed of sheep is derived from a district of Porphyry, situated in the north of Northumberland, and extending into Scotland, forming the mountains termed Cheviot. This district has produced from time immemorial a race of sheep entirely distinct in its characters from the wild heath breed of the elevated moors adjoining."

"The Cheviot sheep," Professor Low further mentions, although he fails to give an explanation as to whether he refers to the unimproved or the improved animal, without which his information is all but worthless, "are destitute of horn in the male and female; their faces and legs are white, exceptions merely occurring in the case of individuals, in which these parts are dun."

As to the breed which Mr Robson used to supply the defects that he considered inherent to his native sheep, a good many contradictory opinions have been expressed. The late Patrick Sellar, for example, from information obtained in Herefordshire, ascribes the improvement to breeding from some tups, other than Leicesters, recommended to a Border farmer by Mr Bakewell.

In recent discussions on this question this theory has been properly left altogether out of account, and the point in dispute has been whether Lincolns or Leicesters were the strain that was introduced. One writer, who has within recent years dealt with the subject on two different occasions, has expressed an opinion first on the one side and then on the other, giving in his earlier writing the preference to the Lincolns, on the authority of a grandson of Mr Robson, and in the other instance pronouncing in favour of the Leicesters, on the not very convincing ruling of "an old man, whose father was shepherd with Mr Robson at the time." Youatt and some others leave the matter untouched, but

fortunately two valuable pieces of evidence that have not, so far as is known, had hitherto the consideration they deserve, are found in Douglas's "Survey of Roxburghshire," published in 1796, and in the volume of "The Farmer's Magazine" for 1803. In the first of these publications it is narrated that "Mr John Edmistoun, late of Mindrum; Mr James Robson, then at Philhope (who, it is incidentally mentioned, came to Scotland in 1760), and Mr Charles Kerr, then at Ricaltoun," went to Lincolnshire about the year 1756 and bought 14 tups, with which they crossed their sheep with great success. The statements made in the "Farmer's Magazine" are equally clear. Giving "an account of the Northumberland breed of sheep, and the progressive improvements thereupon made," a contributor to this magazine, who signs himself "A Northumberland Farmer," incidentally makes reference to Mr Robson's selection in terms that corroborate the account given in the "Survey," and, like it, prove the opinion current in the district within living memory of the event to have been unshaded by any doubt.

In discussing the difference between what he calls the coast breed, which had its habitat from North Durham southwards to the parish of Warkworth, and the "mugged" or woolly-faced variety, native to the Glendale or Coquetdale Wards, this "Farmer" states that "the superiority of the coast breed was obtained by frequent crosses with the Lincolnshire breed, which at that time were of a more feeding quality, and finer woolled than some years afterwards, previous to their being crossed with the new Leicesters." And then he comes to mention in this connection Mr Robson's breeding. "As a proof," he writes, "of the fineness of Lincolnshire wool at the period alluded to, I need only observe that the late Mr James Robson of Chatto, a most respectable man, and breeder of Cheviot sheep, who then lived at Scotch Belford, purchased some tups from a Mr Mumby, near Barton-upon-Humber, in Lincolnshire, who at that time stood high as a ram breeder. These tups, without injuring the quality, greatly increased the quantity of wool, and gave Mr Robson such a decided superiority over his hill neighbours that for many years, after making the cross, he sold more tups than one half of hill farmers put together."

After the lines had thus been laid for improvement upon a basis, as to which there need be no doubt, the breed rapidly grew in merit and in favour. Of their appearance, now that they had become so popular, there are many descriptions, the best known among which is probably that given in 1792 by Sir John Sinclair,*

* On the establishment of the British Wool Society in 1791 by the late Sir John Sinclair, in conjunction with a considerable number of noblemen and gentlemen, for the purpose of improving the quality of wool by introducing the breeds of sheep most suitable to the different districts of Scotland, several delegates were

who took from the Cheviot Hills 500 sheep, and placed them in Langwell, a farm on the southern boundaries of Caithness-shire, and which afterwards, when in the possession of the late Mr Donald Horne, became known in connection with successful show-yard appearances of the breed. Sir John, who was thus the means of having the sheep introduced into Caithness-shire, does not deal out his praise in any stinted way. In the Cheviot, he thinks the country had what might be called a perfect mountain sheep, both in respect to form and fleece. "Perhaps," he says, "there is no part of the whole island where at first sight a fine-woolled breed of sheep is less to be expected than among the Cheviot Hills. During winter the hills are covered with snow for two, three, and sometimes four months, and they have an ample proportion of bad weather during the other seasons of the year, and yet a sheep is to be found that will thrive even in the wildest part of it. Their shape is excellent, and their forequarter in particular is distinguished by such justness of proportion as to be equal in weight to the hind one. Their limbs are of a length to fit them for travelling, and enable them to pass over bogs and snows through which a shorter-legged animal could not penetrate."

With this sketch of their characteristics, Mr Culley, an authority whose opinion cannot be passed by, does not agree, because, he says,—"forequarter wanting depth in the chest, and breadth both there and in the chine." A third opinion, which is of some weight, is that of "The Lammermuir Farmer," a breeder and careful observer of sheep who lived in the early part of the present century, and whose opinion has been honoured in being quoted by Darwin. This "Farmer" says that "they are hornless, the face and legs generally white, the eye lively and prominent, the countenance open and pleasing, the ear large, and with a long space from the ear to the eye, the body long, and hence they are called long sheep, in distinction from the blackfaced breed. They are full behind the shoulder, they have a long

appointed to visit the principal sheep districts of England and Scotland to examine the different breeds and report upon their respective merits. During these investigations, a breed was discovered on the borders of England and Scotland, which Sir John considered well-suited for being bred and reared in Highland districts. They were white-faced, and from their length were called "the long sheep," in contradistinction to the short or blackfaced breed. To these sheep Sir John gave the name of "the Cheviot breed," from the circumstance that they were found in greatest perfection among the Cheviot Hills, and that he wished to name them after a district so memorable in the history and traditions of the country—the Cheviot Hills being the scene of many conflicts between the English and the Scotch. The name soon became a household word, for, on Mr Nasmyth, one of the agents of the British Wool Society, visiting the southern districts of Scotland some time afterwards, he found the long hill sheep of the east border were better known even then by the name of Cheviots, and that the short hill sheep, or blackfaced, were in some places termed the forest or Linton breed.—*Editor.*

straight back, they are round in the rib and well-proportioned in their quarters, the legs are clean and small-boned, and the pelt is thin, but thickly covered with fine short wool. The wool extends over the whole of the body and comes forward behind the ear, but leaves the face uncovered."

During the time that these pictures were being drawn of them, Cheviot sheep were gradually spreading themselves over a wider and wider range of country. Both in the south and north did they challenge the blackfaces, and drive this breed away from grounds on which they had grazed for many years. The then Lord Napier, in giving evidence before a Committee of the House of Lords which sat about the beginning of the century, says of the current of opinion that set in about the year 1800, that it had caused Cheviot stock to be substituted for blackfaced throughout the Forest of Ettrick and the whole of Selkirkshire; and the late Patrick Sellar, referring to the change of fancy that had come into operation in the north, states that in Sutherlandshire this favourite breed increased in numbers so much that, whereas in 1805 the district contained only a few hundreds, 100,000 fleeces and 20,000 ewes and wedders belonging to one grazier were sent out of the county in 1820. Quite in keeping with this run of popularity is the opinion expressed by Youatt as late as 1837—"The contest," Youatt mentions, "is still being carried on between these valuable breeds, but decidedly in favour of the Cheviots. With every improvement in agriculture they advance. From simple cold their fine and close coat protects them perhaps more effectually than the coarser and looser one of the blackfaced; they may not be quite so patient endurers of hunger, but even on scanty fare they will thrive as well as their rivals. On average, or somewhat superior, pasture they will leave them far behind; and the time will probably arrive when, with the exception of a few and not very extensive districts, it will be acknowledged to be the only breed worthy of the Highlands of Scotland,"—a conclusion that was no doubt warranted at the time, but which has since been proved incorrect.

Between the years 1800 and 1860 the tide continued to run in favour of the breed. In that time the blackfaced disappeared from nearly all the best farms in the south of Scotland, except in the mountainous districts of Ayrshire and Lanarkshire, and even in these their grazings were encroached upon. Throughout Caithness and Sutherland Cheviots were found almost everywhere; and there was a large proportion of them in Ross-shire, Inverness-shire, Argyleshire, and Perthshire. Since 1860, however, the breed has lost ground owing to causes that will be afterwards touched upon.

In the management of this breed there is considerable variety of practice, and, in describing their treatment, it is therefore

necessary to distinguish between the styles that are found in three great divisions of country. First, there is what is called the west-country system, which is followed in Selkirkshire, the western part of Roxburghshire, Peeblesshire, Dumfriesshire, and Kirkcudbright; then the east border system, which prevails in the eastern part of Roxburghshire and Northumberland; and, thirdly, the north-country practice, which extends over the counties of Sutherland, Caithness, Ross, Inverness, and Argyle. In respect of its popularity as well as of its own excellence, the west-country management, which has now supplanted the east border practice over a large stretch of country, claims precedence.

In indicating the routine of events on the farm, the most suitable time at which to make a start is perhaps about the middle of October, after the draft ewes have been sent away, and the flock adjusted to the number which the holding is capable of keeping. Throughout what has been termed the west country, it should, however, be first stated, the stocks range in numbers from 60 to 100 score, reaching in a few instances as high a total as between 3000 and 4000; and the rent, which has risen 2s. or 3s. per head within the last ten years, is generally from 10s. to 12s. per head, though in some cases even more than the latter figure is paid.

In the treatment of his sheep the first principle acted upon by the farmer is, that all ages shall graze together. As in this particular his east border neighbour differs from him, the west-countryman has a right to have it stated for him that his practice has received the commendation of so high an authority as Little. This well-known writer, in his work on "Mountain Sheep," points out with great clearness what occurred to him as the advantages of this system:—"When the ewes and gimmers and the hoggs go at large on the same pasture," he writes, "the land is more equally pastured; there is no trouble or danger in shifting; the hoggs, in time of storm, are better led in search of food along with the old sheep than by themselves; being continued in the place where they were lambed, they are not so apt to stray from the farm; and the shepherds are not at so great a loss in looking over the hill or sheepwalk in storms."

Passing from this, the first part of the year's work to be noticed is the dipping. This operation the majority of farmers prefer to see carried through about the end of October; some, on the other hand, delay the work till the month of January or February; and this practice, though it is not as yet the most extensively adopted, is perhaps the most judicious, seeing that the sheep can be freed from vermin much better at this later period than they can possibly be in October, when, in fact, very few of these pests are developed. To the late dipping the only objection that can be urged is the difficulty of falling

upon suitable weather; but, when the advantages derived are in the one case substantially greater than in the other, the inconvenience of one or two delays and disappointments may very well be submitted to. The dips which give most satisfaction are those in which carbolic acid is the active ingredient. Of the use of arsenic many farmers have almost a superstitious horror, it never occurring to them that in many of the dips which they freely use this useful though poisonous material is present. Instead of burning the wool, or bringing out the teeth of the animal, arsenic has been found by extensive flock-masters to be exceedingly efficacious, so long, of course, as it is used with care and judgment. One mixture which has been used by a few, year after year, with uniform success is very simple in its character, it being possible for any farmer to prepare it for himself: it consists of 1 gallon of soluble carbolic acid, adding about 90 gallons of water, and then mixing with these 2 lbs. of arsenic which has been dissolved by being slowly boiled in 2 or 3 gallons of water with about 4 lbs. of pearl ash or washing soda. With this dip stock can be treated at the cost of about 4s. 6d. per 100,—the price of 1 gallon of carbolic acid, which, with the proper addition of water, is sufficient for this number, being 4s., and of the arsenic and soda, 6d.

The old custom of smearing with tar and butter, which was common enough thirty or forty years ago, has, it should be mentioned, almost died out. Whether or not it was formerly the case that an unsmeared sheep was generally a lean sheep, the experience now-a-days in the south country is, that the animals derive no benefit from the operation, or, at all events, no benefit which will repay the necessary expense.

The October dipping over, the next matter to engage attention is the stock-keeling of the different hirsels, each of which has its own mark. At this time account is also taken of the number of the stock.

Then follows the tupping of the ewes, as to the proper time for which hill-farmers are more agreed than they are about anything else, the 22d November being the day almost invariably recognised as the beginning of the tupping season. Within ten days after the rams are sent out to the hill, the hoggs, not being wanted to breed, are bratted. To one tup the number of ewes commonly assigned is three score. Where tup lambs are bred—and it need hardly be said it is always a useful thing to have a number of this class of stock—proper care should be taken to see that a select number of ewes are "shed" to a select ram.

As to the bringing in of the tups, some little difference of opinion has arisen, a number, and no doubt this section is in the majority, keeping by the 1st January as the proper time, while others delay for ten or twelve days longer. When the tups are

left the longer time with the ewes, the number of eild sheep is reduced ; and this the supporters of the old system do not deny, their contention being, that where ewes continue lambing into June, it is after all better to have them eild. The answer to this objection, and it is difficult to see that it is not a sufficient one, is, that when there is a late ewe lamb to sell, as high a figure may be obtained for it as for any lamb sent off the farm, and that even when the lamb is a male it leaves a profit, excepting only when the mother is one of the old ewes.

In the winter there is often, as farmers have sometimes learned to their cost, considerable difficulty in keeping the stock in satisfactory condition. Should artificial or hand-feeding become necessary, the fodder most in favour and most to be commended is bog hay. The practice of feeding with corn seldom gives satisfaction, as this indulgence generally causes serious deterioration in the habits of the sheep, and even hay should be used only in extreme cases. At no season is the skill of the shepherd of greater importance to his master than at this,—a man who lays out his sheep judiciously, so as to work through the storm without help, almost always finishing better than his neighbour who resorts to hay.

As lambing approaches, two preparations for this critical season should be made, the udder locking of the gimmers and hoggs,which, though not generally practised, is decidedly advantageous, and the drawing out of the leanest and some of the apparently twin-bearing ewes to any enclosure there may be upon the farm. These enclosures or parks the tenant may find of the greatest service, and where the land is suitable, and there are few farms on which some place of the kind cannot be found, it is essential that they should be provided, the proprietor bearing, perhaps, the greater part of the expense. With these parks under rotation to work with, the farmer is enabled to supplement his sheep-breeding by grazing a few cattle, these animals, after being housed in winter, taking the place of the ewes on the hills when the latter are drawn into the parks, and being afterwards, in June, before they have had an opportunity of damaging the pastures, brought back to the enclosures which the sheep have just left. Where the land is not suitable for ploughing, farmers might perhaps adopt a practice which is seen in several districts where the parks, after being enclosed, are drained and limed, and then grazed with cattle and cropped with hay alternately. With these precautions taken, the farmer has then to wait for the beginning of lambing, which takes place on the 17th April. It is this period into which the anxieties of the year are in a great measure compressed, and when a good shepherd is again able to prove his value to his master, his superior skill being often apparent by the way in which, in stormy weather, he uses

his knowledge of the ground in the selection of sheltered places for the ewes.

To one man the entire hirsel allotted is commonly thirty score, this number being reckoned to afford him pretty constant work, and an assistant being generally allowed at this season when a larger stock is under his care, or even sometimes when the land is of such a nature that it is difficult to attend to the thirty score. Where the tups have been taken off the hill on the 1st of January, lambing is brought to a close about the old term day, the 26th of May; but, of course, if the tupping has been allowed to continue ten days longer than usual, it is not till the end of the first week in June that the shepherd gets through this part of his work.

Of tup eild sheep the average is as a rule one to the score. Twin lambs, unless for "beating up the deaths," are no advantage, except where the farmer has parks to keep them till about the end of June, after which they will do well on the hill. The ability to work in this way with twins is, of course, another benefit obtained from enclosing ground.

Within nine or ten days after lambing is over the castration of the lambs is begun, and the selection of those that are to be kept as tups is then made. About this operation of castration there is a pretty widespread belief that it is only some shepherds having a special aptitude for the work who are likely to make a "lucky cutting," and if all that was wanted to support this theory was the fact that occasionally serious loss results from the handling of the lambs at this time, it would be sufficiently well borne out. The cause of any exceptional fatality is, however, as a rule, to be found not in the castration itself, but in the manner in which the lambs are brought together, as in this matter there is sometimes a little thoughtlessness where the greatest care should be taken. This being the first occasion of the lambs being gathered together, the folding is a new experience to them, and, what between the loss of their mothers and the noise that often prevails, it is a very easy thing to throw the still delicate little animals into a state of heat and excitement that altogether unfits them for undergoing any operation. The best preventive against fatal results is accordingly to secure that the folding shall be done as quietly and carefully as possible, and that in the subsequent handling of the lambs all unnecessary roughness be avoided. Sometimes, no doubt, even when the treatment of the lambs has been all that could be wished, a large loss has been sustained, but when the precautions in question are taken, the death-rate is usually a good deal less than it would otherwise be. The system of operating that is almost everywhere adopted is still the old fashioned one of the shepherd working upon the lamb with his teeth, taking care at

the same time to hold well back with his hands so as to keep pressure away as much as possible from the bowels. A new method of operating by means of hot irons has been introduced, but as yet it has not been adopted to any extent except in the Tyne districts of Northumberland. For this system the advantages claimed are that, treated with it the lambs are less liable to death than in the other case, and that (though this opinion may be much doubted) the masculine character of the animal is less destroyed; but perhaps the reason which has most favoured its adoption has been that with it castration may be delayed for some little time, giving the lambs, of course, time to become stronger.

In different seasons the death-rate among the lambs varies very much. A percentage of one in the score is always reckoned a serious loss, but it has sometimes happened that as many as ten per score have dropped off, while, on the other hand, there have been seasons when among a thousand there would not be more than five lambs lost.

About the 20th or 25th June, when washing is begun, the old sheep again come in for their share of attention. In arranging for washing, the farmer should always bear in mind that it is desirable to allow an interval of at least ten days between this work and clipping time, seeing that if the wool is taken from the sheep too soon after it has been cleansed the effect upon the animal cannot be good, while the fleece itself is most likely shorn when it is under its proper natural weight, owing to the sap not having had time to return. In washing, prior to which, as in the case of castration, all unnecessary bustle and heating should be prevented, the sheep are usually made to swim twice through a pond or washing pool, and, after this simple cleansing, the animals are in ten days' time ready for the shears. The old practice of clipping upon stools is still pretty common, but when big heavy sheep have to be dealt with, it is perhaps most advisable to clip them on the ground without tying their feet, the other method exposing the animals to considerable risk of bruises and internal injuries. It is imperative in all cases that the sheep be not clipped except when their coats are perfectly dry. In connection with this work, two other duties are also overtaken—the counting of the stock and the buisting or branding of the sheep with the initials of the owner or any other stamp that is in use in the flock. The average clip of a Cheviot may be stated at 4 lbs., it being considered a large return when this is exceeded. For the disposal of their fleece flock-masters have great facilities provided at the three largely attended markets of the year—Hawick for the west country, Jedburgh for the east borders, and Inverness for the north.—and at the numerous wool sales at Edinburgh and Glasgow, which are now

very largely patronised. But, notwithstanding that they have still as formerly every opportunity of securing the best terms, farmers have lately found the sale of this class of wool one of the most unsatisfactory transactions connected with sheep-farming. Formerly 36s. per stone of 24 lbs. was considered a fair average price, but at present rates are as low as from 20s. to 23s. Of this fall there was some experience last season, for the prices then current did not range higher than from 30s. to 32s., but it is only within the present year (1879) that the drop has become so great, the depreciation this season having been equal to nearly 10s. per stone. One cause of this serious depression is no doubt the prevalence of bad trade throughout the country and the consequent restriction in the expenditure of communities, and, in so far as the markets are affected by this, a revival may of course be expected. But, on the other hand, another cause that has to be taken cognizance of may not be so temporary in its operation, and this is the supply of wool sent into the home country by Australian and colonial farmers, who, by crossing their sheep with Lincoln and Leicester tups, have got into a class of fleece with which they have been able to undersell the Cheviot. After the clipping, the next work that has to be attended to is the speaning of the lambs, which takes place between the middle and the end of August. At this time a selection is made of the top ewe lambs which are to be kept for maintaining the stock; and the seconds, as well as the wedder lambs, are then put into the market. Of late, the demand for Cheviot ewe lambs has been exceptionally brisk, owing to the practice of crossing them with Leicester tups, and as high a figure as 36s. has been got, while a common price has been from 26s. to 28s. After a severe season, however, there are, unfortunately, almost none of these lambs to sell. For some time past the trade for wedder lambs has been a disappointing one. Formerly they were very much in request for grazing in Fife and one or two other north-eastern counties, but for this purpose half-breds are now the favourites. Another circumstance that has told against the trade is, that in the Highlands a good deal of land that was once under Cheviot wedders has been thrown into deer-forests, and buyers from the north have consequently had fewer commissions.

With the disposal of the draft ewes, which are, in the western district, sent away at six-year old, the year's round of management is brought to a close about the beginning of October. In regard to the payment of the shepherd, it should be mentioned that the common practice is to pay in kind,—every man having in his hirsel from forty to forty-five of his own sheep, which are handed from one shepherd to another by valuation. This system has, however, been recently discontinued on a

number of farms, and the tendency is to come to a money wage. Under both systems the shepherd has a house provided, with a cow's grass, ground for potatoes, and 65 stones of meal, and, where paid in money, he receives from £30 to £33; while in the other instance, he pockets as a rule the proceeds of his pack clear of expenses.

In the east border district, where rents range about 8s. per head, and where there has not perhaps been the same rise as in the west country, the system of management differs in one or two important respects from that just described. The practice here adopted is no doubt the older of the two, and at one time west country farmers followed it; but, as has been indicated, it is now confined to a comparatively small area. In the first place, the east border man does not allow all ages of sheep to go together, but keeps one age grazing upon one part and a second age upon another, shifting the stock, as a rule, once every year. This, it is said, is necessary in order to prevent "pining," a disease which is also pretty common in the west country, where a change of food for a short time is generally found effectual in making the sheep thrive. Then, no lambs are taken from the gimmers, which consequently go eild. The wether lambs are not sold, but are kept and put on a part of the farm retained as a wether hirsel, and the draft ewes are put away at five-year old. In consequence of no lambs being taken from the gimmers and of the ewes being sold at the age mentioned, there are few ewe lambs to sell; and the revenue of the farm is therefore altogether dependent upon the wool, and the sale of the cast ewes and three-year old wethers.

In this district the time of speaning is also earlier, taking place about the middle of July. The reason of this it is difficult to conjecture, though it is not impossible that the date may never have been changed since the time when it was usual to make ewe-milk cheese. The lambs after being speaned are put to a bit of grazing called "summering ground," kept specially for this purpose. The size of the farms on the east borders is very similar to that common in the west country.

Throughout the Highland counties there is not the same uniformity in the method of farming as in the two districts already referred to. In the counties of Sutherland and Ross the practice is not unlike that of the east borders, a circumstance that may be accounted for by the fact, that it was by men from the latter district that Cheviot farming was introduced into these localities. There, of course, as in the other Highland counties, a most costly feature in the management is, the necessity of wintering part of the stock away from the farm. Some years ago, the expenses attending this were comparatively trifling, but since the farmers, who formerly

provided wintering, have taken to feeding stock of their own, the cost has, within fifteen years, risen 100 per cent.

Over the whole of the north it was in the past the custom to smear all ages of the sheep about the end of October, but of late, it has been the practice to leave the hogs unsmeared, and the substitution of dipping for smearing, even with the older sheep, has been growing in favour. The objects that those who still smear have in view are,—to keep in check scab, a disease seldom met with in the south, but almost everywhere prevalent in the north, and the protection of the sheep from the weather.

In Sutherland and Ross the treatment of the flock is, as has been said, to a large extent the same as in the east borders, except that all ages of sheep are allowed to go together. On the west coast, however, the management more resembles that of the west country. There, in a great many cases, the gimmers are tupped, though, latterly, some farmers have ceased doing this, and the ewes are kept till six-year old and sometimes older. On some farms, too, the hoggs are wintered at home. The wether lambs, however, are kept in both districts and sold as three-year old wethers, and most of the ewe lambs are required to maintain the stock.

One of the greatest improvements that could be suggested regarding Highland farming in general, is, certainly, that the different holdings should be fenced, and this is said keeping quite in view the size of the farms, and the cost and difficulty that would necessarily attend the work. If the farms were in this way cut off from one another, a farmer would be able to put upon the place only what he considered a reasonable stock, and he might consequently manage to winter more sheep at home. As matters stand at present overstocking is almost everywhere the practice,—one man keeping up an excessive number, in order, as he says, to prevent his neighbour eating him up; and the blame being thus passed from one to another. Another advantage secured would be a diminution in the number of stragglers, of which there is sometimes so large a proportion, that in a flock of 6000 there may be 250 entirely lost, not to speak of the trouble, and expense, and injury incurred in the recovery of such sheep as are found. Till fencing is adopted there can be no hope of clearing the Highlands of "scab" as stragglers are at present the fruitful source of contamination. Tenants of grazings adjoining deer-forests would also greatly benefit by this improvement. On these places the sheep cause both vexation and outlay for extra herding by their constant endeavours to break through into the clear ground of the forest, and once upon this land they are beyond the reach of their owner till the shooting season is over, as sportsmen naturally enough object to have the deer disturbed. If the farms were

enclosed the numerous disputes and complaints that take place on this score would, of course, be prevented. A size of farm pretty common in the north is one carrying 5000 sheep in summer, and the rent is usually from 3s. to 4s. per head, and, in rare cases, up to 7s.

The diseases to which Cheviots are subject are simply those common to other hill sheep. In the absence of any exceptional fatality the ordinary death-rate in the south is 1 per score, but in the north-west Highlands it frequently reaches 3 per score. Of the diseases the most common are "braxy," "rot," "louping-ill," "pining," "sturdy," "scab," and "foot-rot."

Braxy is a disease more of locality than breed, and is almost entirely confined to hoggs. Its appearance is usually first noted for the season about the middle of September, and the greatest loss from it occurs in the months of October and November. The loss occasioned is always worst after a dry summer, and during a rapid rush of grass in autumn. The progress of the disease is so rapid that animals, in the majority of cases, succumb without any trace of illness having been noticed. When affected sheep are observed, they are dull and listless, and considerably swollen in the belly, and able to move only with difficulty. When the illness has come to this stage death rapidly supervenes, and the carcase, when examined, is more or less blackened, and has a tendency to rapid decomposition. The bowels show signs of violent congestion, the coats being black in different places. The disease admits of no cure; but in its prevention judicious hirselling, so as to give the sheep both change of food and exercise, may have some effect. Where the loss is very heavy, the entire removal of the hoggs during the fatal season is necessary.

Rot is due to a parasite in the liver called the "fluke," and is now less prevalent since drainage has been extended. The symptoms are fully developed towards the end of spring. The animal has then frequently a "poke" or swelling under the jaw, and is emaciated in condition, and bloodless or yellow in the eyes. There is no cure for the disease at this stage.

In regard to the nature of *louping-ill* there is as yet great difference of opinion, but the subject is at present engaging the special attention of Teviotdale farmers. The disease seems to be a nervous affection marked by a great variety of symptoms, and probably arises from some form of indigestion. It may be noted that very frequently "ticks" are found in diseased land, but it cannot be considered that these are the cause of the disease though so often co-existent.

Pining, as the name implies, means a more or less rapid wasting or loss of flesh, and is due principally to the eating of too large a quantity of coarse indigestible and non-nutritious

grasses. On certain farms this disease appears annually about the beginning of June, and, as in the case of braxy, the best treatment that can be adopted is careful hirselling, which means turning the sheep to the low grounds in the morning and back to the heights in the afternoon. This precaution lessens the disease very much, and removes it almost entirely in many cases.

Sturdy commonly attacks young sheep, and its symptoms are fully developed when the animal is about one year old. It is characterised by stupidity and a tendency to turn to one side, hence the use of the term "turnsick" in some localities. When this latter symptom is fully developed, it is found that the animal is blind in one eye, and that it turns to the side at which it still sees. The cause of this blindness is the existence in the head of a sack or "blob" of water, which presses upon the brain. This "blob" is a sack containing a fluid surrounding the embryo of a tapeworm peculiar to the dog, and it is not always found in the same position, hence a noticeable difference in the symptoms. When it is near the surface of the brain, the skull, over the spot, soon begins to bulge and soften. It is essential that the animal be relieved before the disease has been fully established, because the brain wastes as the "blob" grows. The best method of removing the fluid is by boring upon the blind side, and not upon the side the sheep turns to (as has been so generally believed), by means of specially prepared instruments. The opinion regarding the existence of the tapeworm is not accepted by the majority of sheep-owners and shepherds, but where the "blob" is submitted to a microscopic examination, the head and hooklets of the worm are easily seen, and if these be given to a healthy dog the parasite rapidly develops itself.

Scab is a skin disease, manifested first by a discoloration of the wool on the shoulders and back, due to the sheep scratching itself in consequence of itch. When examined closely, certain spots are seen to be covered by a yellowish powder, which, if removed, discloses raw spots upon the skin, and if these are gently scratched, the animal shows evident satisfaction by movements of its mouth and feet. This is purely a contagious disease due to the presence of a parasite, termed "acarus," which rambles about the surface of the skin and breeds rapidly. It is capable of being cured by the use of a dip consisting of spirits or oil of tar, tobacco paper, soft soap, and pearl ash. To 90 gallons of water, which serve for the dipping of 100 sheep, the proper additions for this mixture are 2 gallons of spirits of tar and 10 lbs. of each of the other ingredients.

Foot-Rot is most commonly found upon soft grassy land, particularly about the end of summer when the dews become heavy. It usually begins with a "scalding" between the hoofs, which opens the foot at the heel and soon develops into a sore,

discharging a thin fœtid matter. The best treatment is the careful removal of all loose horn, and the dressing of the raw surface with a mixture of carbolic acid and oil, or a solution of terchloride of iron, which has a hardening effect upon the hoof. Prevention, however, it need hardly be said, is better than cure, and it has been practically proved that the driving of the sheep through troughs containing a solution of arsenic dissolved with potash, as recommended in regard to dipping, will harden the hoof and keep away the disease. This practice should be begun about the time when foot-rot is expected, and continued weekly till the middle of October. In filling the troughs, which should not contain more than 3 inches of water, the proportion of arsenic to be added is 1 lb. for every 5 gallons.

The breeding of Cheviot sale tups has of late become perhaps too much the fashion, many of the animals exposed at the annual ram sales bringing no more than butchers' prices. The breeders who have taken a really prominent position are, on the other hand, comparatively few in number. In the west country, Mr Brydon, Kinnelhead, has for many years been recognised as the most successful exposer, and next to him stand Mr Johnstone, Archbank; Mr Welsh, Ericstane; Mr Grieve, Skelfhill; and Mr Moffat, Craik. In the east borders a very considerable amount of support has been obtained by Mr Elliot, Hindhope; Mr Robson, Byrness; and Messrs Ord, Lumsden, while, by the Lammermuir flock of Mr Archibald, Glengelt, a high position has also been taken.

The tastes prevailing in the different districts have led to several kinds of sheep, each having very distinct characteristics, being placed in the markets. Breeders in the west country have given too much attention to the production of a stylish animal, without being sufficiently careful in seeing that with style was combined width round the heart, and thickness of coat. The east border sheep have, on the contrary, had better fleeces and better "middles," but they generally were deficient in quarters and head. Since 1860, however, and especially within the last ten years, the stock of both districts have been a good deal improved in their weak points, and have consequently come to resemble each other more than before.

The highest figure that has hitherto been brought by a Cheviot tup, it should be stated, is 185 guineas. For this sum the Kinnelhead ram, "Craigphadraig," the first prize tup at the Highland Society's show at Inverness in 1865, was sold at Beattock sale in 1867. Mr Brydon has also the credit of having obtained the highest average price ever quoted at a tup sale, having in 1865 reached £14, 14s. Next to this figure, the largest average realised at any sale has been £12, 16s., which Mr Archibald's Glengelt lot made in 1873 at Hawick.

The points of a Cheviot sheep should be, a deep well-sprung rib; its coat good in quality, thick and free from "kemp" hair, and filling the hand well; its head, while not too heavy, should be prominent and broad, well set off by a bright dark eye and erect ears of moderate length, and covered (like its legs) with clean hard white hair; its neck strong and pretty well kept up; its chest deep and wide; its shoulders lying well back; its back and loins short, firm, and broad; its quarter long and level; its thigh full; its tail broad and rough; its legs flat and clean, with well-developed joints; and its step free and active. The deterioration in the breed, of which so much has been heard, has been caused by sheep being brought out too long in the neck, and with high thin faces, which could not denote anything but diminished hardiness of constitution. Too little attention has been given to the importance of the wool being thick and good in quality, and there has also been a want of observation in not cultivating the strain of sheep that have come best through severe weather in winter and spring. In order to remedy these defects it is necessary that care be taken to have the ribs well developed, and that the fleece be always taken account of. Another point that ought never to be lost sight of is to breed from sheep possessed of good milking qualities. As a rule, the breeder should never keep on a badly nursed lamb as a tup; but, at the same time, were this rule followed too closely, injustice might be done to a gimmer, a ewe that had twins, or an animal that had met with some slight accident; and it is, therefore, better in every case to act only on personal observation as to which strain are good milkers.

In the tup trade, within the last few months, there has been one feature which cannot be regarded as other than unfortunate and unsatisfactory,—to make it a point in the selection of tups that they should be as ugly and ungainly as are to be had, without any reference to the modification of the breed in the direction just indicated. Another and very serious mistake often made is the supposition that it is the size of the sheep that has produced their softness, and that a tup cannot be had too small, it being quite forgotten that it was the want of good ribs and a looseness in fleece that was the cause of the deterioration, and that diminutive animals, unless free from these defects, cannot be hardy. The precise system most likely to give success in breeding must be ascertained by every breeder for himself, as personal observation is all-important; but there are one or two general principles that must in every case be kept in mind. Among those principles are heredity, variability, and selection; the first, a principle which necessitates careful in-and-in breeding, and the second being necessary to afford scope for selection. To a certain extent, as has been indicated, in-and-in breeding is indispensable, though,

at the same time, it should be stated that among Cheviot sheep it has not been practised to the same extent as among some other breeds, of which the flocks kept are less numerous. It is only by affinity in blood that character can be fixed and retained, and that a strong family resemblance can be given to a flock, and an impressive size obtained. But, on the other hand, there is this danger connected with this system, that when it is carried to an extreme it leads to a loss of constitutional vigour and fertility, and this danger is all the more to be kept in view seeing that the evils develop themselves gradually. The strongest advocates of the principle of "in-and-in" breeding have, it is well known, taken great care to observe secrecy as to any cross they may have introduced into their flocks, in order that their reputation as breeders for special qualities might not suffer; but there can be no doubt that they, like others, have been compelled to guard against the weaknesses induced by too close relationships. As to the exact number of crosses that should be allowed, it is impossible to lay down any rule. It is, however, to be remembered that when a cross is made with altogether new blood, long lost characteristics are generally brought up in the offspring, and a greater amount of variability introduced. When, therefore, a sheep of a different family is used, a selection should be made of an animal possessing those points that are being worked for, or, it may be, of its having those qualities that may be expected to remedy defects in the original strain. In using this animal the breeder should restrict himself, in the first instance, to a comparatively small number of his best ewes, from the offspring of which he can then make a choice of tups to be retained for further crossing, this method having been found, where acted upon, very successful. When these trials are being made, the closest attention is necessary, as even with likely-looking animals the results are often disappointing. In following out the principle of selection, the systematic prosecution of one idea through a long course of years is necessary, as it is only by continually striving after the attainment of a type which is present to the mind of the breeder, and working with varieties of animals that will lead up to this mark, that any breed can be permanently altered. One important circumstance to be remembered in the management of stock is the attention demanded by the law of co-relation,—a law which connects the presence of one point in an animal with the presence of some second or attendant characteristic, and which is as yet very imperfectly understood. Of the operation of this law, Darwin has given numerous instances. White cats with blue eyes are, for example, almost invariably deaf; and pigeons that are feathered on the outside of their legs and on their toes have generally their two outer toes connected with a membrane. Among Cheviot sheep it has been observed

that there is the same connection between the absence of wool from the belly and the possession of good milking qualities, and that a large number of small black "ticks" are generally found on the faces of stylish sheep, while among blackfaced stock it has been noticed that a dun-coloured face and freedom from blueness in the fleece have the same co-relation. The lesson to be deduced from this is a very obvious one,—that care must be taken, lest in the modification of one point the breeder is, at the same time, effecting a complete change in other characteristics which he did not contemplate.

Since 1860, as has been said, Cheviots have rather lost favour. This is perhaps to be accounted for by the circumstance that prior to that year their popularity was so great as to cause them to be placed on ground not adapted for them. Blackfaced stock, too, have latterly met a much better trade than they formerly did, owing to the brisk demand that has sprung up for blackfaced ewe lambs, and cast ewes for crossing purposes with Leicester tups, as well as to the advantage which their superior hardiness gives them in a severe season. But should Cheviot breeders, as a class, be wise enough to profit by the lessons which ought by this time to have been brought home to them by their exceptional experiences, it need not be long before a sheep of a sufficiently hardy character is again the prevailing type. The breed will then be able to hold its own against its opponents.

ON THE OLD AND REMARKABLE ASH TREES (*FRAXINUS EXCELSIOR*) IN SCOTLAND.

By Robert Hutchison, of Carlowrie.

[*Premium—The Gold Medal.*]

Continuing the catalogue of old and remarkable forest trees in Scotland, initiated by the Highland and Agricultural Society last year, by an exhaustive report on the Spanish chestnuts (*Castonea Vesca*) of the country at the present day, the subject of this—the second chapter of the hitherto imperfectly written literature and record of our old trees—is the Ash. Probably next to the sycamore, if not equally with it, no tree has been more generally planted in Scotland than the ash (*Fraxinus excelsior*). By many it is considered to be indigenous to the country. Loudon evidently thought so; but another authority repudiated the idea, and based his conclusions upon the circumstance, that in no instance have any traces of the

remains of ash trees been found in any of the peat-bogs or morasses from which, from time to time, roots and stumps of former sylva have been exhumed, nor in any deep excavations made in other soils, nor in the timbers of old buildings in Scotland. This argument, however, is easily met by the objection, that in none of such situations is it the least likely that ash tree timber would be found. In the first place, it is well known that in peat-bog soil or wet morasses ash will not grow; in the next place, the nature of the tree is to throw out shallow or surface-feeding roots, so that it could not be looked for in deep excavations; and, as to its use for constructive purposes, its wood is quite unsuited for such purposes, and too valuable for use in other respects, as, for example, for agricultural implements and tools, to admit of its being used for beams of houses. It may therefore be safely assumed that the ash is one of our indigenous forest trees in Scotland, as, from the earliest records, we find it in use, both as supplying material for the deadly instruments of warfare, and for the peaceful implements of agriculture.

In former times, curious superstitions were attached to this tree. The Scandinavians introduced the ash into their mythology, and their *Edda* represents the court of the gods as held under a mighty ash, whose summit reaches to heaven, while its branches overshadow the entire earth, and its roots penetrate to the infernal regions. Serpents are twined round its trunk. Man, according to the *Edda*, was formed from the wood of the ash tree. Pliny and Dioscorides both notice it as being repugnant to serpents, and as a cure for their bite. In our own land, at no remote period, country people had a superstition, that if they split young ash trees, and made ruptured children pass through the cleft, they would be cured. A curious tree is figured in "The Gentleman's Magazine" for 1804, p. 909, which was said to have been so used. It grew near Birmingham, and showed two trunks, parted, and quite distinct, at a short distance from the root, and afterwards joined again. It had been split to cure rupture in a child of a neighbouring farmer, and it is supposed that the two parts thus separated became covered with bark, and so formed two trunks at this point. Trees so used were preserved with great care, for the belief was, that if the tree was felled the rupture returned, mortified, and killed the person formerly cured! Probably the "Glammis" tree at Castle Huntly, in Perthshire, which is noticed in Dr Walker's "Catalogue of Old Trees," was a tree so used,—the word "glammis," in north country dialect, signifying "pincers" or tongs. This tree, from inquiry, is now gone. In 1812 it measured at 3 feet from the ground, 17 feet in circumference; and at the root, 27 feet. It fell of natural decay in 1864. Another super-

stition in regard to the ash, consisted in boring a hole in a branch and enclosing within it a living shrew mouse; so prepared, the branch was used to thrash cattle afflicted with cramp or lameness, both of which were laid to the charge of the unfortunate mouse, and a cure was thereby supposed to be effected!

We have referred to the frequency with which the ash and sycamore have been planted in Scotland. They are frequently found in close proximity together around farm-steadings and hamlets in isolated spots, and on hill-sides exposed to the blast. The one was doubtless selected from the shade which its umbrageous foliage afforded; and the other, for the utility of its timber in mechanical purposes; and both, from their hardihood in withstanding the severity of the wind uninjured. Unlike the sycamore, however, the ash is more fastidious as to soil, and will not succeed in wet water-logged subsoils, where it soon becomes "stag-headed;" but in deep loam, or in soil of a friable nature, even at considerable altitude, the ash will attain great height, its roots running for long distances near the surface, or forcing its tortuous rootlets towards any running brook, under which it delights to spread them. No deciduous tree whatever in cultivation in our plantations, is more injurious to plants growing under it than the ash, from its long and numerously-spread fibrous roots, which, being near the surface, completely exhaust the soil, and deter the vegetation of other plants less favourably provided by nature with such feeders. Mr Fennel, in an article of interest on the ash, in "The Mirror" (vol. xxv., p. 212), notices a remarkable tree in Norfolk which, when cut down, although only 45 feet high, was found to have a root 133 feet in length. This habit renders it also an unsuitable tree to plant in hedgerows on farms, for it is apt to choke the drains with its rootlets.

The ash is deteriorated, when it has attained to about 20 feet in height, by severe pruning. This should be done when very young, or what is better, if planted in masses with other trees at due distance, yet sufficiently close to one another, nature will assist herself in rearing trees of straight clear boles, devoid of heavy side limbs, and this is the description of tree which presents most qualifications for timber purposes. It is the root-cut of the bole in the ash which is most tough, elastic, and durable; and this applies to the sapling as much as to the tree of full-grown proportions. Indeed, there is no tree which can be so soon found marketable for many varied purposes as the ash,—young trees, of a few inches diameter, being valuable for shafts and implement handles; while the shoots from the stools of felled trees are eagerly sought for, on account of their suppleness, elasticity, and toughness.

Having been, therefore, one of the first of the deciduous trees planted by our ancestors, it is frequently found in groups, or in lines and squares, marking the site of some old mansion or hamlet now no longer in existence; and such landmarks are quite common in Scotland. That this tree was used, although not so frequently as the sycamore or sweet chesnut and oak, to mark the spot of some event, or to celebrate some hero or saint, cannot be doubted from the many names which individual trees still bear in many parts of the country, although the events or the individuals themselves have faded from the world's memory. We have, amongst recorded trees of the ash species, now no longer to be traced or identified, the "Maiden of Midstrath," at Birse, in Aberdeenshire. This tree was supposed to have existed about the end of the sixteenth century. At the time of its fall, in a gale in 1833, it girthed 21 feet near the ground, and 18 feet at 9 feet above. Dr Walker and other tree historians have recorded a celebrated ash which stood in the churchyard at Kilmalie, Argyleshire; which is a common position in which we find old ash trees in other parishes in Scotland, whether from any superstition or not in regard to it, has never been ascertained. This Kilmalie ash was long supposed to be the biggest tree in North Britain. It was held in reverence by Lochiel, at whose parish church it stood, and by his retainers and clansmen, and this fact probably hastened its demolition, for in 1746 it was burnt by the soldiery to the ground. Examined in October 1764, its circumference could then be traced very accurately, and its diameter was found to be in one direction, 17 feet 3 inches, and its cross diameter, 21 feet. Its circumference at the ground, taken before two credible witnesses, was 58 feet. It grew in rich deep soil, about 30 feet above sea-level, with a small rivulet running within a few yards of its site. It was described then, by one who had known it before its destruction, as not a *tall* tree, for it divided into three great arms about 8 feet from the ground. Visited again in 1771, all vestige of it was quite obliterated. The famous Finavon Spanish chestnut tree, which was long considered the biggest tree in Scotland, is thus eclipsed by this ash, for the chestnut girthed at a foot from the ground, 42 feet 8½ inches; but the two must have been contemporaries; and as Walker puts the age of the chestnut at about 500 years (prior to 1812, when he wrote), the Kilmalie ash was probably therefore about the same age. Another very remarkable ash grew at Bonhill, Dumbartonshire, being a sort of "family tree" of the Smolletts, who have been proprietors of Bonhill for a very long period. It had been surrounded, for its preservation, with a sloping mound of earth about 3 feet in height. In September 1784, at the top of this embankment it girthed 34 feet 1 inch: at 4 feet higher up, it was 21 feet

3 inches; and at 12 feet from the ground, it was 22 feet 9 inches; where it divided into three huge arms. At this point, the leading trunk had, about a century before, been broken over, in consequence of which the tree had become hollowed. One of these arms measured 10 feet 4 inches; another, 11 feet; and the third, 12 feet in girth; and yet they seem not to have been original branches, but only pollards formed after the trunk was broken over. As the stump had become quite hollow, and open on one side, we learn from Dr Walker that the opening was formed into a door, and the decayed heart scooped out, so that a room was formed in it, 9 feet 1 inch in diameter, with a conical roof 11 feet high; and was floored, and surrounded with a hexagonal bench, on which eighteen people could sit; and above the door, five small leaden windows were fitted. In this condition this remarkable trunk lived on, forming a great deal of young wood in the shell or bark; and in 1812, Dr Walker states that "it was thickly covered with fresh vigorous branches, and, by this sort of renovation, may continue to live, nobody can say how long." After very careful inquiry, we have been so fortunate as to ascertain that a remnant of this remarkable tree still exists. There is remaining a shell, about 12 feet high and 3 feet broad, of one side of its trunk, covered with healthy bark and young twigs. This relic is surrounded by an iron railing for its protection. The bark is still well covered with small branches; and about 18 inches from the ground, a pretty large branch has sprung up, which may, in future centuries, be a rival to its sire. Judging from the dimensions given by Dr Walker, this ash may fairly be allowed to divide the honour of being the largest of its day, in Scotland, with the Kilmalie tree.

In the parish churchyard of Bonhill stood another venerable ash tree, which, in September 1784, measured, at 3 feet from the ground, 17 feet 9 inches; but at 1 foot above the ground, it was no less than 33 feet in girth. It was about 50 feet in height, and had a wide spreading head. In 1768 it was measured by Mr Beevor, and found to be 16 feet 9 inches at 5 feet above the ground. In 1812 it was quite fresh and vigorous. This tree perished in a gale on 1st November 1845. Its circumference, at 3 feet from the root, was 26 feet 6 inches; and at its bifurcation, 22½ feet. Its north branch was 13 feet, and its south limb 12½ feet in girth. The circle round the base was 63 feet; and its height considerably over 100 feet; and the spread of its branches 100 feet in diameter. A lithograph of the tree hangs in the session-house of the parish church; and two chairs, made from the wood of the tree, stand in the vestibule of the church, and bear the following inscription:—"This chair, with another of the same wood and pattern, made by James Nairn, cabinetmaker in Bonhill, of part of the great ash

tree that stood for centuries in the south-west corner of the kirkyard of the parish of that name, and fell by a very high wind on 1st November 1845, was presented to the Established Church in that parish by the Rev. William Gregor, minister thereof, on the 16th January 1847." The wood was sold to more than one joiner, and was made into articles of furniture. The lithograph of the tree referred to was sold in the parish, and is still to be seen in several houses; it was mounted in a frame made from the wood of the tree itself. The ash, already referred to, which grew at Castle Huntly, in Perthshire, called the "Glammis Tree," and which in 1796 girthed 17 feet at 5 feet high, and 27 feet near the root, was overturned in a gale in 1864, and was very much decayed. No precaution had been taken to prolong its existence, or stay the course of nature's decay during the latter years of its life. Many large old trees, the best on this estate, have been felled during recent years. Two ash trees on Inch Murin, Loch Lomond, are mentioned by Walker as having been of considerable dimensions, and although in a decaying condition, from having been broken over about 8 feet from the ground, they then still continued to throw out groups of branches from their sides. The one girthed in 1784, at 3 feet from the ground, 20 feet 8 inches, and the other, 28 feet 5 inches. One of these trees, we have just ascertained from Mr Gordon, forester on Luss estate, still exists, and is rather a curious relic. It is quite hollow, and appears to have at some time been broken over about 7 feet above the ground. Just below the break numerous shoots have, however, formed all round the trunk, and are now from 10 to 18 inches in diameter, and have established a connection with the old roots of the stump, which appear still vigorous. A zone of fresh wood and bark has been thus formed over the old hollow trunk, which now measures 25 feet in circumference. The thickness of this hollow shell is from 6 to 16 inches, and the whole forms a sort of roofless chamber, in which from four to six adults may stand without inconvenience. The moist climate and humidity of the district of Loch Lomond is very favourable for the development of tree-life, and in the neighbourhood there are some very large timber trees. The old ash tree at Mellerstain, in Berwickshire, noticed by Walker as being, in 1795, 80 feet in height, and then eighty years old, with a girth of 8 feet 1 inch at 3 feet above ground, which must have, however, considerably increased after he wrote, for, on inquiry, we have ascertained that when it was broken across about 6 feet above ground many years ago, it was of "very extraordinary size;" and Lord Haddington had a paling erected to protect the stump, which was covered over with ivy, but by degrees it decayed entirely, and no trace of it now remains.

But, although we have thus traced the last days of so many of

the notable trees chronicled by Dr Walker, Sir T. D. Lauder, and others, it still remains, before referring to the list we have tabulated and appended to this report, to notice the existence and condition, at the present day, of others still surviving, and whose dimensions are recorded in Dr Walker's and other catalogues. The ash at Earl's Mill (Darnaway), in Morayshire, which Sir T. D. Lauder in 1826 states to have measured 16 feet in girth at 3 feet from the ground, is still in existence, but is now a mere shell, girthing at 1 foot high 20 feet 6 inches, and 18 feet 5 inches at 5 feet from the ground. It is 60 feet in height, and has a clear bole of 10 feet (see Appendix). The old ash noticed by Dr Walker as growing in the fruit garden at Loudoun Castle in Ayrshire, still survives. It was in October 1776 9 feet 7 inches in girth at 4 feet above the ground, and in September 1879 it was found to be 21 feet 8 inches at 1 foot, and 13 feet 4 inches at 5 feet from the ground, with a bole of 15 feet, and a total height of 80 feet. It grows in black loam on a clayey subsoil at an altitude of 259 feet, and is exposed to the west. Its top is now dead, but its lateral branches still bear good foliage, although its trunk shows symptoms of decay. The ash at Lochwood Castle, Dumfriesshire, which, growing in a high and exposed situation (about 900 feet altitude), girthed, on 29th April 1773, 10 feet 6 inches at 4 feet from the ground, being then 70 feet high and quite fresh and vigorous, still survives in pristine vigour, and measured in September 1879 21 feet 2 inches at a foot above ground, and 17 feet at 5 feet, being about 80 feet in height, with a bole of 9 feet 3 inches in length. The Newbattle ash, which on 6th July 1789 measured 11 feet 4 inches, still survives, and, although showing signs of being internally decayed, produces abundance of healthy foliage. This tree in 1863 measured 14 feet in circumference at 3 feet from the ground, and is now (1879) 21 feet 4 inches at 1 foot, 15 feet 2 inches at 3 feet, and 14 feet 4 inches at 5 feet from the ground. This tree is as remarkable for its length of bole and lofty head as for its other dimensions; the bole is nearly 50 feet in length, and had the tree not had the misfortune to lose, very many years ago, a great part of its head, it would have now been probably the tallest ash in Scotland. Before this accident befel it, Lord Anerum had its height accurately taken, and it was then found to be 112 feet. This must have been about the year 1790, as Dr Walker in 1812 notices the fact that a great part of its head had, since its measurement *in girth* in July 1789, been broken over by a storm. The ash on the island in Lochleven, which on 17th September 1796 measured 12 feet in girth at 4 feet from the ground, still survives, but is much decayed. It was split by lightning in 1801, and has never recovered from the damage then sustained. This tree is sometimes called "Queen

Mary's Tree," probably owing to its conspicuous size and appearance rather than from any other reason, for tradition does not associate the queen's name with the tree from her having been said to have planted it, while there is a white hawthorn in the garden of the castle which is believed to have been planted by her during her imprisonment on the island. This thorn was blown over in 1850; but there is a vigorous and healthy young offshoot from it, now 12 feet high. The ash was probably coeval with the building of the castle on the island. The old ash at the ferry over the Tay, near the church of Logierait, Perthshire, in July 1770 measured 16 feet in girth at 4 feet from the ground. It was then a healthy well-shaped tree about 70 feet high, and was well known in the country by the name of the "Ash Tree of the Boat of Logierait." It still continues to live on and thrive. The lower part of the trunk is quite a shell, and has been formed into a summer-house or arbour, capable of containing a considerable number of people. Popular tradition ascribes the great size of this tree to the richness of the soil around it, from the fact of its having been the "dool tree" of the district, on which caitiffs and robbers were formerly executed, and their bodies left hanging on the tree till they dropped and lay around unburied! The present circumference of this tree is, at 1 foot from the ground, 40 feet 4 inches, and at 6 feet up it is 29 feet 7 inches. Another notable ash tree, mentioned in the chronicles of former writers, is the Carnock Ash, in Stirlingshire, known to have been planted by Sir Thomas Nicholson, Lord Advocate to King James VI. This tree, we believe, is still in existence, but as yet we have been unable to obtain exact measurements of its remains at the present time. In 1826 it was 90 feet high, and girthed at the ground 31 feet, and 19 feet 3 inches at 5 feet above the ground, and 21 feet 6 inches at 9 feet; at 10 feet it divided into three huge limbs, each of which was fully 10 feet in circumference. Several others of the recorded ash trees, in various districts, still survive, although as mere shells or stumps; and the good feeling of their proprietors is shown towards the interest taken by the public in these and such-like relics of a bygone age, from the means so frequently adopted to preserve even the slightest remnant of such decayed and fallen greatness and majesty. It would be prolonging this paper too much to notice each instance of such care for the "ashes" of the dead past; and, having already, perhaps, too indulgently noticed the principal of these fragments of declining natural picturesqueness and former grandeur, we shall refer to some of the many hitherto *unrecorded* or unobserved grand examples contained and tabulated in the Appendix to this Report, and which represents generally the statistics of the old ash trees of Scotland at the present day. Of course, it should be mentioned that in this list many notably large or remarkable

trees may have been omitted; indeed, it is almost impossible, within the limited time at disposal for the preparation of such a report, to enlist the sympathy and excite the enthusiasm of proprietors and foresters in all the districts of Scotland, to furnish materials,—each from his own estate or charge,—of every tree of large dimensions worthy of record; and while, therefore, the list may be thus so far imperfect, it may be hoped that the publication of so many accurately-ascertained dimensions of existing large trees will instil a spirit of enterprise into the minds of others who have not yet responded to various inquiries, so that they also may be induced, by contributing facts coming under their notice, to make the list, on some future occasion, even more complete than it is at present.

There are some districts in Scotland in which, without an intimate knowledge of the salubrity of the local climate, one would not expect to find trees of great magnitude. In Ross-shire, for example, we do not generally associate the county with a capability for raising heavy timber, but returns from Brahan Castle change the views on this subject which may have been entertained by many people. Here we find, along with other forest trees, an *ash* 110 feet in height, with a bole of 17 feet in length, and a girth of 18 feet 3 inches at 1 foot, and of 12 feet 8 inches at 3 feet above ground. This tree is growing vigorously, having increased in circumference, at 1 foot from the ground, 27 inches since 1863, or 1·80 inches per annum since that period. It grows in heavy black loam, on a subsoil of sand and clay. In the park at Brodie Castle, Morayshire, also, there are some fine and very large timber trees, including ash, of which we have been able to give details. These trees were planted between 1650 and 1680. At Keith Hall, Aberdeenshire, there are some very good specimens of ash and other hard-wooded timber trees, averaging from 15 feet at 1 foot, to 13 feet in girth at 5 feet from the ground, down to young trees, very healthy and thriving, at various altitudes from 200 to 350 feet above sea-level, in loamy soil over hard gravel, and also in bog-earthy soil over clay and till on the lower situations near the river side. We take the more trouble to notice this locality, and the growth of old trees, of which we have given several instances in the tabulated Appendix, because a recent writer on the woods of Aberdeenshire, in an article published elsewhere, stated that there was no old and large wood in this locality "excepting a few old gean trees." Of these we have ascertained that there are some seven or eight rather *poor* specimens, while there are many fine old ash and other timber trees of various descriptions, besides thriving young plantations of coniferous and mixed hard-wooded varieties. At Gray estate, on the farm of Benvie, Forfarshire, there is a very fine old ash which, now growing in deep clay on a sandy subsoil, girths 27 feet at 1 foot

from the ground, and 16 feet 6 inches at 5 feet, and has a clean bole of 30 feet, and lofty towering head about 80 feet in height. Two of the ash trees given in the table, from Kinnaird Castle, Forfarshire,—being No. 1 and No. 5 in the list from that station, are not in full vigour, and are showing symptoms of declining age. No. 5 is hollow and decayed about 6 feet up the stem in the centre, and has been cleared out of its rotten timber and fitted with a circular seat capable of holding four men. It is still, however, covered with healthy and abundant foliage. The ash, No. 1 in the Kinnaird return, has always been known by the name of "Adam," and its neighbour, now gone, which grew about 100 yards from it, was called "Eve." Unfortunately Adam's partner was broken across about 15 feet from the ground, a few years ago, by a heavy gale of wind, and the stump, which had bid defiance to the blast for generations, is now fast crumbling to dust. At Scone Palace, and at Lord Mansfield's other estates in Perthshire, there are some fine specimens of old ash trees, though they are not so plentiful as the examples of some other descriptions of forest trees. A magnificent tall specimen is given in the returns, 115 feet in height, with a clear bole of 40 feet, and girthing 11 feet 2 inches at 5 feet above ground; while another, also at Scone, is 85 feet high, and girths 13 feet 8 inches at 5 feet above the ground. The Kincairney Ash, near Dunkeld, Perthshire, which Loudon assigns to a distinct variety, and calls *Fraxinus excelsior Kincairniæ*, from its peculiarity and distinctness of habit in having its "spray alternately pendulous and rigidly upright, thus forming a tree of fantastic shape," is described in the return as 13 feet 9 inches in girth at 1 foot, and 12 feet 8 inches at 5 feet from the ground, with a short bole of about 8 feet, and 50 feet in height. It is, independently of the peculiarity referred to, a very picturesque tree, with most curiously twisted limbs. Unfortunately, we have just learnt that its chief branch has this year been broken off, from its having suffered last winter from the frost and superincumbent weight of snow. A very venerable-looking ash stands near the site of the Old House of Abercairny, Perthshire. In 1863 it girthed 19 feet at 3 feet high, and is now 19 feet 1 inch, having only grown 1 inch in bulk in sixteen years, a circumstance which, taken along with its gaunt and naked appearance, shows that this grand old tree is evidently on the wane. With commendable care and foresight, it is scrupulously attended to and protected by its proprietor. Would that many other landowners would go and do likewise! Were this the case, many a noble old tree,—landmarks in the history of the locality in which they have grown, and to whose physical features they have lent their charms, and amid whose associations they have declined,—would be preserved for years to come

to show what once they were, and to assist, by their survival, in recording and fixing what slender memory still lingers regarding many old reminiscences linked with their history, although dying out in practice at the present day.

A very handsome ash, which also grows in Perthshire,—that "land of trees" *par excellence*,—is the Redgorton ash,—to be seen on the farm of Pitmurthly. At Bonskeid we have also found a good example. It girthed 20 feet at 3 feet from the ground in 1876, and is now 20 feet 2 inches. It has been a good deal disfigured by the loss of a large branch, during recent years, but is still vigorous and forming wood. On the South Inch of Perth there is a fine ash tree, growing next to a very fine Scotch elm. This ash measures in circumference 14 feet 5 inches at 5 feet from the ground, and is quite vigorous. An old ash, of historical celebrity, still stands in a waning state in the south-west corner of the churchyard of the parish of Moulin, near Pitlochry village. In olden times culprits were chained to this tree, while they were awaiting their doom (generally *final*) at the hands of the Council of Lairds, who were the administrators of justice (?) in the Highlands in mediæval times. These were the same executioners of justice who used the ash tree at the ferry of Logierait as their gibbet for that district. What their preference for *ash* was, both prior to and for the execution of their victims, does not appear, but probably there existed in these superstitious times, some association of doleful nature with this tree. A remarkable collection or group of old ash trees may be seen at the churchyard of Oldhamstocks, in East Lothian, which is surrounded on each side by them in a single row. They seem very old, and gaps, where two have evidently perished, have been re-filled by two elms. The survivors number ten, and we have given the dimensions of some of the best in the tabulated list appended. They are very tall and weather-beaten, being exposed very much to the blast. The date on a portion of the church is 1581, about which time they were probably planted. Another singular group of three ash trees stands in a field immediately to the east of Whittinghame churchyard, also in East Lothian. The largest given in our appendix is a very handsome tree measuring in circumference 14 feet 5 inches at 1 foot, and 11 feet 3 inches at 6 feet from the ground, and has a large wide-spreading head 95 feet in height. It divides into two huge limbs at 12 feet high. The second of the group is 12 feet 6 inches at 2 feet, and 8 feet 9 inches at 6 feet, with a bole 20 feet in length, and is 85 feet high. The third is smaller. There are in the same field other eight ash trees, a lime, horse chestnut, and beech, all certainly very old trees. From their position, and also from the fact of there still existing a quaint old well about the centre of the field, and near the group referred to, there probably at one time had been

some church or religious house about this site, of which no record now seems to exist. One of the tallest ash trees we have been able to record is growing, and is still quite vigorous, at Milu-Graden, close by the banks of the Tweed, in Berwickshire. It measured, in September 1878, 121 feet 3 inches in height, with a clear bole of 55 feet, and it girthed, at 1 foot from the ground, 15 feet 5 inches, and 12 feet 2½ inches at 5 feet. In point of height this tree is only surpassed by one in the tabulated list, which is growing in Bute, on the estate of Mount-Stuart, which is said to have attained a height of 134 feet, with a bole, however, of only 36 feet.

Having thus reviewed the principal old and remarkable ash trees which we have been able to find in Scotland, as well as noticed and compared the condition at the present day of many individual trees previously chronicled by former writers, it only remains to notice some curious proverbs and superstitions connected with this tree in some localities. We have already referred to its being used for the supposed cure of ruptured children. The well-known popular adage in regard to its foliation, when contrasted with that of the oak, as prognosticating a wet or dry summer is familiar to every one. "May your footfall be by the root of an ash," is a north country proverb, signifying "May you get a firm footing," and is given as a God-speed to travellers. It is, of course, derived from the property possessed by the ash roots,—which will not live in stagnant boggy land,—of drying and draining the adjacent soil when merely damp. In the midland counties of England a proverb still exists, that, if there are no seed keys on the ash in any season, there will then be no king in the country within that twelvemonth, in allusion, doubtless, to the fact that the ash is never wholly destitute of keys. In some parts of the Highlands, a custom prevailed, at the birth of a child, for the nurse to put one end of a green ash stick into the fire, and while burning, to gather in a spoon the sap or juice which oozed out at the other end, and to administer this as the first spoonful of food to the newly born child. What the expected benefits to the child from so curious a custom may have been, it is impossible to say. In Devonshire the yule log took the form of the *Ashton faggot*, and is still, in some remote hamlets, brought in and burnt with great merriment. It is composed of a bundle of *ash* sticks bound or hooped round with bands of the same tree, and the number of these last ought to be nine. The rods having been cut a few days previously, the farm labourers on Christmas Eve sally forth joyously, bind them together, and then, by the aid of one or two horses, drag the faggot, with great rejoicings, to the master's house, where it is deposited on the spacious hearth, which serves as the fireplace in old-fashioned kitchens. Fun and jollity then

prevail, and it is an acknowledged and time-honoured custom that for every *crack* which the bands of the Ashton faggot make when bursting, from being charred through, the master is bound to furnish a fresh bowl of liquor! These, and the fact of so many ash trees being planted in country churchyards, and near old monastic ruins, clearly point to the tree having been held in superstitious reverence from some old legend now lost or forgotten.

APPENDIX—Description of

County.	Place.	Altitude above Sea-Level.	Soil.	Subsoil.	Exposure of Site.
		Ft. in.			
Aberdeen, .	Keith Hall, . .	..	Deep loam, . .	Clay, . . .	S.E.
,,	,,	..	,,	,,	,,
,,	,,	..	,,	,,	,,
,,	,,	..	,,	,,	,,
,,	,,	..	,,	,,	,,
,,	,,	..	,,	,,	,,
,,	Gordon Castle, .	150 0	Dark sandy loam, .	Bluish sandy clay,	,,
Moray, . .	Darnaway, . .	200 0	Gravel and clay, .	Sand and clay, . .	N.E.
,,	,,	..	Sandy peat, . .	Peaty, . . .	,,
,,	Brodie Park, . .	..	Deep sandy loam, .	Sand and clay, .	N.E.
,,	,,	..	,,	,,	,,
,,	,,	..	,,	,,	,,
Ross, . .	Brahan, . . .	..	Heavy black loam,	Sand and clay, .	W. and S.
Forfar, . .	Gray, . . .	120 0	Deep clay, . .	Sand and gravel .	S.W.
,,	,,	,,	,,	,,	,,
,,	Kinnaird Castle, .	40 0	Sandy loam, . .	Gravel . . .	..
,,	,,	60 0	,,	,,	..
,,	,,	70 0	,,	,,	..
,,	,,	,,	,,	,,	..
,,	,,	,,	,,	,,	..
,,	,,	60 0	,,	,,	..
,,	,,	30 0	,,	,,	..
,,	,,	30 0	,,	,,	..
,,	,,	30 0	,,	,,	..
Perth, . .	Scone Palace, .	50 0	Deep loam, . .	Clay and gravel, .	Sheltered,
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	,,
,,	Castle Menzies, .	250 0	Light sandy loam, .	Pure sand, . .	Sheltered,
,,	Kincairney, . .	500 0	Stiff loam, . .	Strong clay, . .	S.W.
,,	,,	,,	,,	,,	N.
,,	Abercairney, . .	200 0	Good dry loam, .	Gravelly . .	S.
,,	Ochtertyre, . .	380 0	Light earthy, .	Gravel, sand, or rock.	S
,,	Redgerton, . .	150 0	Loam, . . .	Clay and till, .	S.
,,	Bonskeid, . .	..	Light loam, . .	Gravel, . . .	,,
,,	Inch of Perth, .	..	,,	Sand and gravel,	S.
,,	Logierait, .	..	Sandy loam, . .	Gravel and sand, .	Open.
,,	Dunfallandy, .	..	,,	Gravel and clay, .	E.

THE ASH TREE (*Fraxinus excelsior*).

Height of Tree.	Length of Bole.	Present Circumference of Trunk at			Any former recorded Measurements and Dates.			Diameter of Spread of Branches.	REMARKS.
		1 foot.	3 feet.	5 feet.	Date.	At 1 Foot.	At 3 Feet.		
Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.		Ft. in.	Ft. in.	Ft. in.	
70 0	24 0	12 5	..	11 2	..	..	..	..	This is an average tree in an avenue of twenty.
65 0	16 0	15 8	..	13 7					
63 0	15 0	15 1	..	13 6					
65 0	14 0	12 10	..	11 7					
60 0	18 0	12 8	..	11 4					
70 0	9 0	17 1	..	15 9	..	..	..	..	Forks into four limbs at 9 ft. from the ground.
70 0	..	20 9	..	15 8					
60 0	10 0	20 6	19 6	18 5	1836	..	16 0	..	Growing at Earlsmill. This is the tree mentioned by Walker.
50 0	13 0	24 6	..	18 8	..	..	..	..	Grows in Castle Park.
76 0	7 0	20 11	17 9	..					These trees were planted with many others of similar dimensions between 1650 and 1680.
82 0	..	15 3	12 4	..	..	..	..	..	
70 0	..	14 6	12 3	..					
110 0	17 0	18 3	12 8	..	1863	16 0	..	..	A very handsome tree.
75 0	30 0	27 0	..	16 6	..	..	..	..	About 150 ft. S.W. of Benvie Farm House.
70 0	33 6	19 0	..	11 2	..	..	..	..	Do. do.
70 0	50 0	20 2	..	18 3	..	..	..	..	Getting stag-horned at top.
60 0	40 0	21 1	..	14 2	..	..	..	..	A fine old specimen, covered with ivy.
55 0	30 0	20 9	..	16 1					
50 0	16 0	22 0	..	14 0					
60 0	30 0	19 6	..	14 0	..	..	..	..	Hollow trunk, fitted with seat inside.
60 0	30 0	10 9	..	8 6					
60 0	36 0	11 2	..	9 6					
50 0	30 0	12 6	..	12 8					
52 0	18 0	11 4	..	10 10					
115 0	40 0	..	..	11 2					
90 0	26 0	..	..	13 1					
85 0	25 0	..	..	13 8					
83 0	40 0	13 1	10 0	10 0					
50 0	8 0	13 9	13 0	12 8	..	..	..	..	A very picturesque tree, with very curiously twisted limbs.
80 0	..	13 10	12 7	12 0					
90 0	20 0	..	19 11	..	1863	..	19 0	..	A very venerable-looking tree. Is decaying. Gaunt and naked, but is carefully preserved by proprietor.
85 0	40 0	..	19 0	18 3	..	..	..	..	Seems to be decaying internally.
64 0	12 0	..	16 10	..	1863	..	14 10	84 0	
85 0	20 0	..	20 3	..	..	..	..	..	In 1876 it girthed at same point, 20 ft.
70 0	22 0	..	..	14 5	..	..	..	..	
63 0	..	..	40 0	..	..	..	..	..	In 1770 it girthed at 4ft. high, 16 ft.
75 0	15 0	15 0	13 10	13 7	..	..	..	..	Has a clean bole for 15 ft., and then it divides into two limbs of 10 ft. in girth each. Stands near the Dunfallandy Sculptured Stone.

DESCRIPTION OF

County.	Place.	Altitude above Sea-Level. Ft. in.	Soil.	Subsoil.	Exposure of Site.
Kinross, . .	Cleish Castle, .	600 0	Wet and light, .	Clay, . . .	N.E.
,,	,,	,,	,,	,,	,,
,,	Moreland, . .	560 0	,,	,,	N.W.
,,	Lochleven Castle, .	..	Light sandy soil, .	Gravelly, . .	..
Fife, . .	Otterstone, . .	100 0	Good loam, .	Sand and clay, .	S.W.
,,	Donibristle, . .	35 0	Light loam, . .	Friable subsoil, inclining to gravel.	S.
Mid-Lothian, .	Newbattle, . .	150 0	Light sandy, . .	Gravel, . . .	,,
,,	Braehead, . .	90 0	Deep loam, . .	Stiff clay, . .	W.
	Calder House, . .	..	Sandy loam, . .	Gravel, . . .	,,
,,	Cammo, . . .	90 0	Rich loam, . .	Clayey, . . .	Sheltered,
	,,	,,	,,	,,	,,
,,	Dalkeith Park, .	..	Good loam (deep),	Clay and gravel, .	,,
,,	Woodhouselee, .	730 0	Loam, . . .	Gravel and rock, .	S.E.
,,	,,	,,	,,	,,	,,
West Lothian,	Craigiehall, . .	90 0	Deep loam, . .	Clay and gravel, .	W.
,,	,,	,,	,,	,,	,,
,,	Carlowrie, . .	92 0	,,	,,	,,
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	,,
,,	Hopetoun, . .	250 0	Light loam, . .	Gravel and clay, .	Open,
,,	,,	120 0	Freestone quarry,	Rubbish, . .	Sheltered
East Lothian,	Whittinghame, .	220 0	Red clay loam, .	Sandstone, . .	,,
,,	,,	..	,,	,,	W.
,,	Gilmerton, . .	100 0	,,	,,	,,
,,	Broxmouth, . .	30 0	Very deep red sandy loam,	Gravel and sand, .	,,
,,	Tynninghame, .	50 0	,,	,,	Sheltered
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	,,
,,	Pressmennan, .	650 0	Light soil, . .	Gravelly, . .	E. and N.
,,	Prestonkirk, . .	75 0	,,	Gravelly, and sand,	E.
,,	Innerwick Castle, .	200 0	Light loam, . .	Clayey, . . .	W.
,,	Churchyard at Oldhamstocks.	150 0	Good red loam, .	Gravel, . . .	..
,,	,,	,,	,,	,,	..

THE ASH TREE—*continued.*

Height of Tree.	Length of Bole.	Present Circumference of Trunk at			Any former recorded Measurements and Dates.			Diameter of Spread of Branches.	REMARKS.
		1 foot.	3 feet.	5 feet.	Date.	At 1 Foo	At 3 Feet.		
Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.		Ft. in.	Ft. in.	Ft. in.	
80 0	15 0	12 6	..	8 9	..	..	..	..	Quite vigorous.
76 0	14 0	12 0	.	9 4	..	.	.		Do.
60 0	12 0	8 4	.	8 2	..	..	..	..	Quite healthy at this altitude.
..	..	..	..	..	..	..	..	..	Split by lightning in 1801, and now very much decayed. Measured, in 1796, 12 ft. at 4 ft. high. "Queen Mary's Tree."
30 0	50 0	..	..	13 6	..	..	..	..	Growing in a cleft of its branches is a pretty little spruce.
64 0	18 0	19 10	..	15 3	..	..	..	70 0	A very vigorous tree.
77 0	30 0	21 2	15 1	14 1	..	..	..	..	Quite healthy. Grows by kitchen garden road.
89 0	40 0	11 10	9 10	9 5					
90 0	35 0	13 9	11 0	10 5					
70 0	25 0	16 3	..	12 6					
80 0	30 0	10 6	..	9 6					
90 0	25 0	..	..	13 9	..	..	..	..	Has a fine head. Grows near stables.
78 0	13 0	14 0	..	9 8	..	..	..	..	Fairly healthy. Seem to have
80 0	25 0	10 3	..	9 1	..	..	..	..	attained full maturity.
90 0	30 0	16 0	..	14 4					
85 0	35 0	15 6	..	13 3					
78 0	25 0	12 5	..	10 0	1864	..	9 11	..	
80 0	20 0	11 8	..	10 1	,,	..	9 3	..	
90 0	22 0	10 11	..	9 8	,,	..	9 8	..	
50 0	20 0	..	..	12 2					One of fourteen of similar dimensions forming an avenue to an old mansion of 15th century.
70 0	50 0	..	..	7 4					
65 0	30 0	9 6	..	8 2					
95 0	12 0	14 5	..	11 3	..	..	..	..	Divides into two limbs, 8 ft. 6 in. and 8 ft. 10 in. in girth. Grows in a field east of the churchyard in a group of three.
108 0	36 0	12 0	..	9 2					
60 0	30 0	11 3	..	10 4					
65 0	20 0	13 4	..	9 6					
70 0	24 0	11 3	..	9 4					
70 0	36 0	11 2	..	8 8					
73 0	30 0	9 9	..	8 1					
72 0	20 0	17 1	..	11 4					
80 0	12 0	12 2	..	10 2	..	..	..	..	Grows on banks of the Tyne. The ash here seems to have been planted in groups of four, to strengthen the bank probably.
70 0	24 0	13 7	..	9 8	..	..	..	..	Stands in southmost row of trees (plane and ash) which have surrounded the old garden to west of castle ruins.
70 0	12 0	11 7	..	11 3	..	..	..	..	Next to manse. Slightly stag-headed. Date on church, 1581.
70 0	30 0	10 4	..	9 3	..	..	..	..	Next gate to churchyard (south side).

DESCRIPTION OF

County.	Place.	Altitude above Sea-Level.	Soil.	Subsoil.	Exposure of Site.
East Lothian,	Churchyard at Oldhamstocks,	150	Good red loam, .	Gravel, . . .	W.
,,	Stoneypath Tower, Garvald,	..	Light red sandy loam, . .	,,	E.
		..	,,	,,	S.W.
,		..	,,	,,	,,
,,		..	,,	,,	,,
	Belton,	60 0	Light sandy, . .	,,	Open,
,		,,	,,	,,	,,
,	Biel, . . .	150 0	Damp sandy loam,	,,	Sheltered.
,,	,,	,,	,,	,,	,,
,,	Dunglass, .	200 0	Damp loam, . .	Clay . . .	W.
Berwick, .	Cockburnspath village, .	..	Light sandy, . .	Gravel, . . .	Open,
,,	,,	..	,,	,,	,,
,,	,,	..	,,	,,	,,
,,	Milne-Graden, .	100 0	Light loam, . .	Boulder clay, near rock,	S.
,,	Thirlstane Castle,	..	Clayey loam, . .	Till, . . .	W.
,,	Kimmerghame, .	..	Red loam, . .	Stiff and clayey. .	,,
Roxburgh, .	Cavers, . . .	..	Light loam . .	Gravelly, . .	Sheltered,
Peebles, .	Stobo Castle, .	680 0	Good loam, . .	,,	S.W.
Selkirk, . .	Yair, ...	430 0	Light loam, . .	Till, ...	S.
Dumbarton, .	Bonhill Churchyard.	..	Rich loam, . .	Clay, ...	W.
,,	Bonhill Place, .	..	,,	,,	,,

THE ASH TREE—*continued.*

Height of Tree.	Length of Bole.	Present Circumference of Trunk at			Any former recorded Measurements and and Dates.			Diameter of Spread of Branches.	REMARKS.
		1 foot.	3 feet.	5 feet.	Date.	3 feet.	5 feet.		
Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.					
80 0	8 0	11 0	..	10 10	..	..	..	..	In, south-west corner of churchyard. Girths at base, 20 ft. Divides into two large limbs at 8 ft.; one of these has been torn off by gales.
90 0	22 0	13 1	10 4	10 1	..	..	..	..	Is planted quite close by old castle. No date on building.
70 0	..	14 6	..	11 3	..	..	..	..	Divides into two at 4 ft., and then rejoins. Looks as if two trees had been planted together.
65 0	20 0	10 0	..	9 6					
72 0	25 0	9 10	..	9 0					
83 0	12 0	11 0	..	9 2	..	..	..	..	Quite vigorous. Very tall tree. This and following example grow in a row of trees on south side of policy park and road.
100 0	18 0	16 2	..	11 10	..	..	..	..	A splendid ash. Girths 11 ft. 6 in. at 12 ft. high. Vigourous.
63 0	12 0	12 10	..	13 2	..	..	..	..	Grows at bridge over the burn. Divides into three large limbs. In 1812, according to Loudon, it girthed 11 ft. 4 in. at 5 ft.
70 0	18 0	9 6	..	8 2					
92 0	28 0	12 2	..	10 1					
100 0	40 0	8 9	..	7 8	..	..	..	..	These three trees, standing in a row of four at the roadside beside the inn, are very tall and imposing. [*Girth, 11 ft. 6 in. at 9 ft. high. Divides into two heavy limbs at 18 ft.]
103 0	18 0	11 7	..	11 6*	..	..	..	..	
98 0	30 0	11 5	..	9 10	..	..	..	..	
121 3	55 0	15 5	..	12 2½	..	..	..	..	A very tall tree, growing near the Tweed river.
73 0	35 0	12 6	..	11 9					
80 0	30 0	12 9	11 2	..					
40 0	12 0	19 4	..	15 8	..	..	..	..	A very handsome tree.
70 0	..	15 3	..	14 3½	..	..	..	..	Quite vigorous.
115 0	..	..	20 6	19 9					
113 0	..	..	26 2	..	..	..	..	..	The measurements given are those taken when the tree was blown down in gale of 1st November 1845. It is fully referred to in our Report.
..	..	..	..	..	..	..	..	..	Only a fragment of the shell remains; it is 12 ft. high and 3 ft. wide. It is referred to in our Report.

DESCRIPTION OF

County.	Place.	Altitude above Sea-Level.	Soil.	Subsoil.	Exposure of Site.
Dumbarton, .	Camis Esken, .	50 0	Sandy loam, . .	Gravel, . . .	W.
Renfrew, .	Hawkhead,	..	Good dry loam, .	Clay and gravel, .	Open,
Bute, .	Mount Stuart, .	25 0	Sandy, . . .	Rock, . . .	..
,	Rothesay, . .	..	Light loam, . .	Gravel, . . .	Open,
	,	..	,,	,,	,,
Argyll, . .	Benmore, . .	30 0	Deep rich dry soil,	,,	..
,,	,,	,,	,,	,,	..
,,	,,	,,	,,	,,	..
		,,	,,	,,	..
		,,	,,	,,	..
Ayr,	Loudoun Castle, .	259 0	Black loam . .	Clayey, . . .	W.
,,		,,	,,	,,	Sheltered,
	Lanfine, . .	,,	Light loam, . .	Gravel, . . .	..
,,	Cassillis House, .	180 0	,,	Trap rock, . .	S.W.
Dumfries,	Lochwood Castle,	900 0	Light damp soil, .	Clay, . . .	S.
Wigtown, .	Kennure, . .	100 0	Light loam, . .	Gravelly, . .	Sheltered,

THE ASH TREE—*continued.*

Height of Tree.	Length of Bole.	Present Circumference of Trunk at			Any former recorded Measurements and and Dates.			Diameter of Spread of Branches.	REMARKS.
		1 foot.	3 feet.	5 feet.	Date.	3 feet.	5 feet.		
Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.					
78 0	25 0	14 4	..	12 7	1863	..	..	..	In 1863 it girthed 13 ft. at 1 ft.
95 0	18 0	..	..	10 3					
134 0	36 0	12 1	..	9 6	..	..	..	..	This tree is decaying on one side at 6 ft. from the ground.
66 0	12 0	13 2	..	12 3	1870	..	12 0	..	This tree is called "Eve," and survives her partner "Adam," detailed below.
..	..	..	..	..	..	..	..	..	In October 1872, "Adam" (since fallen) girthed 17ft. 5 in. at 5 ft. It was found to be 220 years old on an examination of its annular rings.
70 0	..	8 2	..	6 9	..	..	..	..	These trees are not remarkable for size, but are given to illustrate how well the ash thrives at this low altitude, so near the sea breeze. The climate is very humid, however, and well adapted for tree growth.
65 0	..	9 6	..	7 3	..	..	..	..	
60 0	..	7 3	..	5 6	..	..	..	..	
55 0	..	9 8	..	5 5	..	..	..	..	
40 0	..	6 7	..	5 10					
80 0	15 0	21 8	..	13 4	..	..	..	..	Grows in the old garden, and is showing symptoms of decay. Top dead, but lateral branches very vigorous.
75 0	1 0	24 0	..	..	..	..	..	..	Springs into four huge stems at a foot from the ground.
70 0	25 0	..	..	15 10					
95 0	..	24 9	..	14 0	..	..	..	..	Grows in house park, about 20 yards from the River Doon.
60 0	9 3	21 2	..	17 0					
100 0	30 0	21 0	..	12 1	..	..	..	..	A very handsome park tree.

ON THE OLD AND REMARKABLE SYCAMORES IN SCOTLAND.

By Robert Hutchison of Carlowrie.

[*Premium—The Gold Medal*]

This tree, which is also styled by some botanical authorities *The Great Maple*, must not, from the vulgar error of its being generally called "*The Plane*," be confounded with the true plane (*Platanus*). Even Dr Walker appears to have fallen into this mistake of calling the sycamore "*The Plane*," and so styles it in every instance in his "Catalogue of Remarkable Trees in Scotland," written about 1790 or 1798, and published in 1812. Considerable doubt appears to have prevailed amongst our earlier botanists as to whether the sycamore is one of the truly indigenous trees to Scotland. In the edition of Miller's "Dictionary," edited by Martyn in 1749, the author remarks that if it were really an indigenous timber tree the whole country would have been overrun by it, from its wonderful fecundity and vitality, and from the exceeding proneness it possesses to propagate itself from the seed-keys. This argument, however, will hardly prove its foreign origin, but rather tends to foster the opposite proposition, for the fact that a tree presents so much capacity in every season of ripening its seeds, and of "self-sowing" its seedlings in any country, points rather to its indigenous characteristics to that soil and climate. But, independently of this argument, there exist sufficient reasons to come to the conclusion that the sycamore is not indigenous either to Scotland or England, but is an introduction from the continent of Europe, and was probably first planted in this country shortly before the beginning of the sixteenth century, or, at all events, not before the middle of the fifteenth. Gerrard, an author of no mean reliance, who wrote in 1596, calls the sycamore "a stranger in England, found only in the park, and places of pleasure of the nobility." Other contemporary writers about that date also refer to it as peculiar to churchyards, courtyards of manor places, and noblemen's grounds. Dr Walker, reasoning from the measurements of old specimens he had himself taken during his long experience and observation, considered it to be one of the earliest introductions of the "exotic" trees into Scotland. He says in the concluding paragraph of his notice of old sycamores, or "Planes," as he calls them (several of which we have been able to identify, and append their dimensions at the present day to this report),—"the first barren trees planted in Scotland were those of exotic growth. These, at the time, were planted in gardens, rather from curiosity or for ornament than for use.

We have no planted oak, ash, elm, or fir, of so old a date (about 1500), as the country was then full of natural woods composed of those trees, and very little demand for them."

Sir Thomas Dick Lauder, who considered the sycamore to be an indigenous tree, notices the predilection for planting it in Scotland, when he says it is "a favourite tree," and "if the doubt of its being a native of Britain be true, which we cannot, however, believe, then it is probable that the long intimacy which subsisted between France and Scotland may be the cause of its being so prevalent in the latter country." With this cause of the origin for the sycamore being so extensively planted in Scotland we are fully inclined to agree, and an additional collateral reason for this assumption is found in the many individual specimens of the sycamore which tradition points to as having been planted by the hapless Mary Queen of Scots, and which to this day are called "Queen Mary's Trees." Several of these, still extant, will be found noticed in the tables appended to this report, and they occur at places where the unfortunate Queen either resided when in Scotland on her return from France, or around the scenes of her dreary imprisonments. Many other fine old relics of these troublous times are still to be found by Border keep and feudal tower, flourishing in vigour by the crumbling ruined fortalice, or in the spot where the baronial garden had once existed, while several of the largest and most noble specimens still linger, and in some instances continue to maintain a green old age, by the ruined monastery and cloister wall. Planted in such sites, evidently with care, and for some special reason—it might be on account of its rarity at the time, or for its hospitable shady foliage—there seems little room for doubt that the sycamore was first introduced from the Continent about the time we have indicated; and for the earliest examples still surviving we must look to such localities as we have described and recorded, in the tabulated appendix to this report.

Another reason for the general diffusion of this tree, after its introduction over the various counties and districts of Scotland, is to be found in the peculiar capacity which its twiggy habits of young wood and growth presents, of withstanding with impunity the severe blasts of wind which are so prevalent in many parts of Scotland, and also its singular suitability for resisting the sea breeze in insular or sea coast localities. Numerous instances of its successful introduction and growth in such situations are recorded in the appendix. Indeed, no better examples could be found than those of the many specimens we have noticed from the sea coast of East Lothian and Berwickshire, where large and handsome trees may be seen situated quite within the influence of the sea breezes and easterly gales that sweep across the North Sea, and yet quite unaffected either in vigour or in contour by

such inclement influences. We find it also planted for shelter and shade round many a hill side and exposed hamlet and steading at high altitudes; and, although at great elevations the sycamore does not attain to the ponderous dimensions it acquires at the lower levels, it still grows to a considerable girth and height of bole even in these higher positions. Thus, for instance, at Woodhouselee, Mid-Lothian, altitude 700 feet (*vide* Return), we find it thriving and vigorous in light gravelly loam, on a gravelly and rocky subsoil, and about 60 feet high, and girthing over 16 feet at 1 foot from the ground, and 13 feet 4 inches at 5 feet; while at other high elevations, such as at Dalwick, Peeblesshire, 800 feet; at Stobo, 745 feet; at Lochwood, Dumfriesshire, 900 feet; at Ardross, Rosshire, 800 feet. Similar and in some cases even larger dimensions are attained by the sycamore (*vide* Table). In regard to soil, this tree is not fastidious; it will be found from our returns to thrive well in any soil which is not overcharged with moisture. In such situations early decay of the trunk and oozing from the stem near the base are produced; but, while preferring an open good loam, rather dry, it is also found thriving in stiff soil inclining to clay. Its progress is most rapid in deep dry soft loam, and in such circumstances it is no uncommon thing to find the sycamore, in Scotland, planted out singly in open situations, attaining 20 feet in height in ten years; and Grigor states he has known instances of its having attained the height of 40 feet in less than twenty years. At Twizel, in Berwickshire, in a light dry loam, the sycamore in twenty-five years attained the height of 35 feet in an exposed situation, and had a diameter of stem near the base of 12 inches.

The sycamore is one of the earliest of our forest trees to put on its foliage in spring. The tints of the opening buds and young tender leaves "are rich, glowing, and harmonious," as Sir T. D. Lauder, in his edition of "Gilpin's Forest Scenery," well describes them. They deepen in summer into darker green, contrasting well with the massive wide-spreading head of the tree, and in autumn the varied browns and reds with which they tartan the woods harmonise well with the lighter yellow shades of the declining foliage of the lime and elm and ash in the landscape. In old trees, the habit of peeling off in scales, which is noticeable in their bark, produces an agreeable effect in the rich contrast between the ashy-grey colour of the adhering bark, and the russet hues thereby produced and displayed in patches along the trunk. Considerable variety and difference of time also, in foliation, is observable in the sycamore in this country. In this respect one tree, still extant and quite vigorous, near the ruins of Corstorphine Castle, and adjoining the old dovecot of that barony, has acquired a unique reputation, and given its name to a new family or variety of the

sycamore. This tree puts forth its buds and young foliage ten days or a fortnight earlier than any other sycamore, of which there are many in the immediate vicinity. Its young foliage—which is very dense, from the compact, close, round-headed habit of the tree, and which has caused Sir Walter Scott to remark appropriately of the "Corstorphine Plane," that it "*has no weather side*," although exposed in the middle of a wide open strath—is at first of a peculiarly rich yellow or golden bronze tint, attracting the eye of the most unobservant visitor to the district. The history of this tree is unrecorded, but tradition reports that it was brought from the East by a monk when it was a mere sapling, and planted where it still stands, the site being then within the church lands, and probably garden ground, of the provostry or collegiate church founded by Sir John Forrester there in 1429. The trees in its immediate vicinity indicate the presence of an old garden having at one time existed around the spot, there being still some remains of large and old yew and holly trees, and also a few fruit trees. The present dimensions of this remarkable and noteworthy tree are as follows:—73 feet in height; length of bole, 22 feet; and 13 feet in girth at 5 feet from the ground. It has recently been banked up with earth round its base to form a rockery for Alpine plants and ferns by the villa proprietor, in whose garden it now stands, and no measurement at a lower point is obtainable. Many young trees have been propagated from this parent tree by grafting and budding, and have all maintained the peculiar golden foliage in spring, quite distinctly; but plants raised from seeds shed by the tree, of which there are very few, the parent being a shy fruit-bearer, vary much, some being blotched and sometimes streaked with lighter variegation, while others have shown no apparent difference from an ordinary sycamore in foliage. They all, however, retain the parent's habit of being in leaf in spring considerably earlier than the other varieties around them.* We ought, perhaps, here to notice another sycamore which presents the same early bronze golden foliage as the Corstorphine tree; it grows in the manse garden at Liberton, near Edinburgh, in the south-west corner, and is in spring quite conspicuous at some distance off by its rich and early bronze foliage and dense round head. It is also evidently an old tree, but it is not so tall or wide-spreading as the Corstorphine tree, apparently owing to its having been placed in a crowded situation, for it seems to be of a similar age to the Corstorphine sycamore. It is remarkable that Dr Walker, in his industrious

* Under this tree, on 26th August 1679, Lord Forrester fell, murdered by his niece by a first marriage, Mrs Christian Nimmo, daughter of Mr Hamilton of Grange, by the Hon. Mary Forrester, and wife of James or Andrew Nimmo, merchants in Edinburgh.—R. H.

search and records of old and remarkable trees, does not notice this tree, while he gives details of two sycamores growing at Redhall, within a few miles from Corstorphine, in no way very remarkable for size at the time he measured them—the one being at 4 feet high only 8 feet 2 inches, and the other 9 feet 4 inches when he wrote. These two trees are still extant, and measured on 13th September 1879—eighty-one years after Walker—they are as follows:—

	Height.	Bole.	Girth 1 ft. high.	Girth 4 ft.	Condition.
No. 1.—In 1798,	...	...	...	8 ft. 2 in.	...
„ „ 1879,	75 ft.	7 ft.	11 ft. 1 in.	10 ft. 2 in.	Stem decaying.
No. 2.—In 1798,	...	...	...	9 ft. 4 in.	...
„ „ 1879,	66 ft.	16 ft.	15 ft. 2 in.	11 ft. 9 in.	Healthy.

These measurements show that in a period of eighty-one years, or rather of eighty-one "growing seasons," these trees have increased in the circumference of their trunks on an average—for No. 1, of 0·271 inches; and for No. 2, of 0·358 inches annually. This is probably a very fair approximate average of the usual increment to the trunk of a tree of the sycamore variety when already what may be termed full grown—that is, after it has ceased to increase perceptibly in height, and has assumed the rugged bark of a full-grown, or rather of a fully-developed tree. The difference between the two trees in point of increase of bulk may easily be understood, when it is stated that No. 1 has for many years shown symptoms of oozing from the stem, thus naturally draining much of its vital sap away, and so hindering the healthy deposit of young wood annually; whereas this has not been the case with No. 2, which is reported to be still quite vigorous, and evincing no symptoms of any decay.

Amongst the remarkable sycamores which have attracted the attention of previous writers, probably the most notable is that known as the "Kippenross Plane Tree." This venerable specimen is now no more, having some years ago been snapt across a few feet above the ground by a gale. This tree is not noticed by Dr Walker, but it is depicted by Nattes in "Scotia depicta," and he gives its girth in 1801 as being 28 feet 9 inches. This measurement must have been taken at the ground line, for in 1798, at 5 feet from the ground, it was 22 feet 6 inches in circumference. This tree was long reported to be the largest tree in North Britain: but this distinction is really due to the large chestnut at Finavon in Forfarshire, recorded in vol. xi. of the Highland Society's "Transactions," p. 43, and now also numbered

with the past. Little authentic information remains regarding the Kippenross tree; of its age the Earl of Mar communicated the following particulars to Mr Monteath, author of the "Foresters' Guide":—"Mr John Stirling of Keir, who died in 1757, and made many inquiries of all the old people, from eighty to ninety years of age, which takes us back to the reign of Charles II. near the Restoration, says, they uniformly declared that they have heard their fathers say that they never remember anything about it, but that it went by the name of the big tree of Kippenross."

Mr Strutt in his magnificent work on old trees, notices a sycamore at Bishopton, in Renfrewshire, opposite Dumbarton Castle, which he figures in "Sylva Scotica," published in 1830, and of which he reports the girth at the ground to be 20 feet at that date, and to be "a stately wide-spreading tree" about 60 feet high. From recent inquiry no trace of this goodly specimen is now to be found. Another remarkable sycamore of which former notices have appeared, and which possessed a curiosity peculiar to itself, was the tree at Calder House. This tree, Dr Walker observes, "stands in the pleasure ground, on the road from the house down to the church." On 4th October 1799 it measured 17 feet 7 inches at 4 feet from the ground. It was called "Knox's Tree," and is known to have been planted before the Reformation. It was the tree to which for many years the iron "jougs" of the church were fastened. It came gradually to grow over them, and for a considerable time prior to 1799 they had become completely enclosed in its trunk. At the place of their imprisonment a huge protuberance had formed on the south side of the tree, and at a height of between 4 and 5 feet from the ground. From minute inquiries made about two months ago, no trace of this tree can now be found, nor does there appear to be any record preserved of the ultimate fate of this historical tree or of its embedded relic. Others, in the lists preserved by Dr Walker and Sir T. D. Lauder, have also disappeared without any record of the time or nature of their removal, a matter much to be regretted in itself, the more so when it is considered that in most instances the only opportunity of accurately fixing the age of the tree has thus been lost.

But, while we have cause to regret the disappearance of many of these old recorded sycamores, it is a subject of gratification to be able to point to and identify others which still exist, and to contrast their dimensions now with those of the earlier records. Many of these will be found in the columns of the appendix to this report. Amongst the most noticeable of these, is the sycamore at Cassillis in Ayrshire, which has, as far back as the past two centuries, gone by the name of the "Cassillis Dool Tree." It stands about 40 feet from the west end of Cassillis

House. At the top of the bole, which is only 8 feet 6 inches high, its head branches off horizontally into 15 large boughs, forming a fine large spreading top. The diameter of the spread of its branches is 76 feet. There is an artificial mound of earth round the base of the tree, 3 feet in height, and all the measurements recorded in our appendix have been taken above, and starting from that point. It is reported to be above three hundred years old; and has always been known as the "dool" tree, or tree of grief. Some of the most remarkable old sycamores and trees of other varieties enjoy the same name; its origin being in the fact that in early times they were used by the powerful barons as gibbets for hanging their prisoners taken in foray, or their refractory vassals. Their use seems to have been more common in this way in the western districts of Scotland. There are three so-called trees still existing in Ayrshire, all of which formerly belonged to the powerful family of Kennedy;—the one at Cassillis already referred to, and the other two at Blairquhan, the largest of which is 72 feet in height, and 17 feet 8 inches in circumference at 10 feet from the ground. The other is somewhat smaller in dimensions. The date on the old escutcheon on the adjoining courtyard is 1573, to which period probably the planting of these trees may be referred. It may be interesting here to narrate briefly the incidents of the last occasion on which the Cassillis dool tree was so used. It occurred above two hundred years ago, when Sir John Faa of Dunbar and seven of his followers were hanged on it, for having attempted, in the guise of a gipsy, to carry off the then Countess of Cassillis, who was the daughter of the Earl of Haddington, and to whom he had been betrothed prior to his going abroad to travel; but in his absence, he having been made a prisoner and detained in Spain, and supposed to have died, the lady married John, Earl of Cassillis. It is said that the lady witnessed the execution of her former lover from her bedroom window. The old sycamore at Ninewells, Berwickshire, mentioned also by Walker, and in a later catalogue published in 1812, girthed 17 feet at a *little below the bows*. It still exists, though decaying, and has always been popularly known by the country people as "old hangie," from the tradition of its having been used as a gibbet in olden times.

The remarkable old sycamore standing near the ruins of the old castle, and on its west side, at Lochwood, Dumfriesshire, girthed, on 29th April 1773, 8 feet 9 inches at 5 feet; and measured, on 5th October 1879, it was 17 feet 7 inches and 13 feet 4 inches at 1 foot and 5 feet respectively. "In 1773," says Walker, "it was a fresh vigorous tree, about 50 feet high, and not in the least 'wind-waved,' though in a very high and exposed situation." It would have gratified the old Professor to

have known that in 1879 it would be still quite vigorous. The altitude of its site is about 900 feet.

Near Dalbeattie, in the Stewartry of Kirkcudbright, there stands a sycamore, which is recognised as a known landmark for miles around, and is called *the Hopehead tree*. It is growing alone in good dry soil, rather sandy, with a rocky subsoil; and in appearance is a complete mushroom, with a short stem, and a wide-spreading flat head, reaching to upwards of 70 feet in diameter. It girths 14 feet 6 inches and 13 feet at 1 foot and 5 feet respectively. We have been unable to trace any tradition regarding this solitary and peculiar tree, although most of such examples have some story or legend regarding their origin. At Foulis Wester, in Perthshire, in the centre of the village, standing on a slight knoll about 4 feet higher than the surrounding ground, is a very large and old sycamore which girths 17 feet and 14 feet 2 inches at 1 foot and 5 feet respectively, with a bole of 14 feet. On inquiring as to the existence of any legend in connection with this tree or its site, we only ascertained that tradition reports that "a Man of Foulis planted it on ae Sabbath nicht, wi' his thoomb!" This village arboriculturist must have literally believed in the old saying, "*Aye* be stickin' in a tree," which accordingly perhaps does not owe its origin to Sir Walter Scott's creative brain!

In other parts of Perthshire notable examples of the sycamore are to be seen. For example, at Birnam, on the banks of the Tay, near to the east ferry of olden times, there is still standing a majestic sycamore, and near to it a venerable oak, which are said to be the last remnant of the celebrated Birnam Wood, referred to by Shakespeare in the play of Macbeth. This tree measures at 1 foot from the ground 23 feet 9 inches, at 3 feet it is 19 feet 9 inches, and at 5 feet it girths 18 feet 11 inches. In 1863 it measured at 3 feet high 19 feet, so that, though an old tree, it is still increasing, and making new wood in its trunk. A large hole which was noticed in the bole, in 1803, has now entirely filled up, and the tree still seems quite vigorous. A very fine sycamore hitherto unobserved, is growing on the Logiealmond estate of the Earl of Mansfield. It is a magnificent massive specimen, girthing 11 feet 2 inches at 5 feet from the ground, and it carries this circumference up the bole for 22 feet. It grows in a light loamy soil on a gravelly subsoil, and is 80 feet in height with a clear bole of 28 feet. When Lord Mansfield purchased the estate about thirty years ago, this tree, Mr M'Corquodale reports to have then contained 309 cubic feet of timber, and, being still a healthy vigorous tree, he estimates that it has added at least 2 cubic feet to its bulk per annum, and it now contains fully 340 cubic feet. It stands in a row of sycamores immediately on the side of one of the

approaches to Logiealmond House, the old main approach to which runs through an avenue of lime, beech, and elm, which is perhaps one of the finest old avenues in Scotland. At Inverardoch, near Doune, there are some very picturesque groups of old sycamores of large size and great beauty. At Balgowan, in Perthshire, at an altitude of 200 feet, we find a sycamore 85 feet in height, with a bole of 28 feet clear, and 20 feet 1 inch in circumference at 1 foot from the ground, and upwards of 15 feet at 5 feet from the ground. Others of almost similar magnitude are noticed in the appendix, growing at Abercairny and Castle Huntly, in this county, so rich in old wood and so suitable for its growth and development; but we regret to add that the largest and best trees have been mostly cut down at the last named place for some years past. Towering above all other sycamores in Perthshire, alike in height and bulk, are those at Castle Menzies, near Aberfeldy, where probably the two finest and largest trees of this species in Scotland exist. They grow at an elevation of 250 feet, in light sandy loam, on a subsoil of sand. No. 1 is 104 feet 3 inches in height, with a majestic bole of 35 feet in length, and is 25 feet 3 inches in girth at 1 foot, and 18 feet 4 inches at 5 feet from the ground. It stands in the open park, and is a very noble looking tree.* No. 2 is one of a row of nearly similar size to itself. It is 95 feet high, with a bole of 15 feet, when it divides into two huge limbs, each being the size of an ordinary tree, and it girths round its colossal conoidal base at 1 foot above ground 32 feet 5 inches, and at 5 feet it is 17 feet 8 inches. In September 1778 this tree girthed 16 feet 8 inches at 3 feet high.

Many other instances and statistics might be given, but a perusal of the figures and details tabulated in the appendix will be found sufficient to convey a generally accurate idea of the diffusion of this favourite tree in Scotland, and it would, therefore, be needlessly repeating facts, were further extracts given, however interesting and instructive these might be. It should not, however, be omitted to mention in detail, those sycamores already alluded to in this report as "Queen Mary's Trees," and one or two others of historical interest.

Queen Mary's sycamore at Scone Palace stands on the lawn, directly under the drawing-room windows, and measures in girth at 1 foot from the ground, 14 feet 9 inches, and at 5 feet it is 13 feet 2 inches in circumference, and is 70 feet in height. In 1863 this tree girthed 12 feet at 1 foot up, and was 60 feet high. At about 12 feet from the ground, the trunk divides itself into two large limbs, which were of equal size; but many years ago,

* Since this paper was written, we regret to state that, in the disastrous "Tay Bridge" gale of 28th December last, this splendid tree has lost two of its largest side limbs. The symmetry of the tree is, however, little impaired.—R. H.

one of these was blown off in a severe gale, at a point about half-way up, leaving only the bare stump remaining of that limb. The tree is consequently much disfigured, as nearly one-half of its head has been carried away, along with the broken limb. This tree has always been known in the memory of the oldest inhabitant as "Queen Mary's Tree," and is believed to have been planted by the hands of the hapless queen herself. There is also another old sycamore at Scone, planted also before the drawing-room windows, which is currently believed to have been planted by Queen Mary's son, James VI. It is now a very picturesque lawn tree, with a short trunk and well-balanced head, and girths at 1 foot from the base 14 feet 2 inches, and at 5 feet 12 feet 8 inches, and is about 60 feet high. Another sycamore, little known to the public generally, although within a very short distance of Edinburgh, is "Queen Mary's Tree," which stands on the north side of the old road between Edinburgh and Dalkeith, about two miles from the city, and close to the farm of "Little France." This hamlet is so named, from the fact that during the residence, at the closely adjoining Castle of Craigmillar, of the unfortunate Mary Queen of Scots, many of her French retainers and followers located themselves there; and it is interesting to note, that at the present day, the occupants of one of the cottages by the roadside, are named "Picard," and trace back for three generations their residence there. This tree is called "Queen Mary's Plane Tree," and is the survivor of two said to have been planted by the queen herself during her sojourn at Craigmillar. Its neighbour, which was planted near the castle, was cut down some years ago; but the tree we have indicated grows in full vigour still, and at 1 foot from the ground measures in circumference 18 feet, and at 4 feet 14 feet 11 inches, and at 8 feet 13 feet 10 inches; with a tall and handsome bole of fully 20 feet in length, where the trunk divides with huge limbs, with a wide umbrageous head, conspicuous a long way off. It measured in height to its highest tip, in 1878, 84 feet 9 inches. On the island of Loch Leven there is an old sycamore called "Queen Mary's Plane Tree," which tradition asserts was planted by the queen while in imprisonment there. It is now 12 feet 9 inches in girth at 5 feet from the ground. Beside it grows an old thorn, also ascribed to the queen. The original tree was blown down in 1850, but there is now a vigorous offshoot from it fully 12 feet in height. The original hawthorn seems to have been planted in what must have been the old garden to the castle, and was always known as "Queen Mary's Thorn. Another old plane or sycamore, noted as a Queen Mary tree, still exists, along with other living relics there of the hapless queen, on the island of Inch-ma-home, on the lake of Menteith. There can be no

doubt whatever that it was planted a long time subsequent to the date of the erection of the priory on the island in A.D. 1238, for along with several others, notably old trees, it and others have been planted and arranged in lines to suit the walls and gateways of the buildings. The one given in our appendix with a peculiarly rich red scaly bark, stands opposite to an old Spanish chestnut and walnut, which is 80 feet in height, and 10 feet in girth at 1 foot, and 8 feet 1 inch at 3 feet high, and 8 feet at 6 feet high, and whose foliage is healthy, but the stem of which is decaying, and oozing a good deal near the root. The sycamore seems perfectly vigorous and sound, is now 13 feet 5 inches at 1 foot, 11 feet at 3 feet, and 11 feet 7 inches at 5 feet from the ground, and 80 feet in height. It is called "Queen Mary's Tree," and near to it, is *Queen Mary's Bower*. The quaint and simple arrangements of this mediæval garden are still quite apparent and visible. There are to be seen three straggling boxwood trees,—evidently grown from the boxwood edgings of a former oval flower-bed still discernible, and whose lineaments are still visible. These trees are now 20 feet 6 inches in height, and girth upwards of 3 feet at 1 foot from the ground, where they diverge into several stems, probably the result of early pruning, and from being kept clipt into form for edgings. In what has apparently been the centre of the plot in this "bower," is a very quaint old thorn tree, about 22 feet in height, and 16 inches in girth, but it is much destroyed by the prevalent west winds that sweep across the island, and to whose influence it is much exposed.

From a glance at the appendix it will be apparent how generally diffused has been the introduction of the sycamore in Scotland. The list might have been increased, for there is hardly a parish in which good specimens are not to be found; but we think enough has been tabulated to give a very fair idea of the sycamore in Scotland at the present day, and of the condition now of those old and formerly recorded trees we have been able to trace, while not a few of goodly size, and which hitherto have been unknown or unnoticed, have been registered for preservation and future observation.

Of the few reported from England, and which have only been taken by way of contrast, we should notice the tree at Cleeve Abbey near Dunster, in Somerset. It is a strikingly picturesque old tree, growing out of the base of a cross, which had belonged to the old Cistercian Abbey there; the stones showing octagonal sides being still visible at its roots. It is nearly 60 feet in height, and measures 18 ft. 3 in. at 1 foot from the ground. Near by stands a very handsome and venerable walnut, probably of the same age, and now 19 ft. 8 in. at 1 foot, and 16 ft. at 5 feet from the ground.

Of the variegated variety of sycamore, good examples exist at the Duke of Athole's grounds at Dunkeld, also at Dollarfield in the valley of the Devon, at Gordon Castle, and at Mount Stuart in Bute. The purple-leaved sycamore is another very beautiful variety. Large trees of it, however, are very rare as yet, and we have fallen in with none of a size worth recording amongst the old and remarkable trees of Scotland. Probably the best specimens of this variety are those at Auchans Castle, near Dundonald, in Ayrshire.

Of the other *Acers* in Scotland, there is a very good specimen of the bird's eye maple (*Acer saccharinum*) at Loganbank, Glencorse, in Midlothian, girthing 6 ft. 9 in. at 3 feet from the ground. Also at Biel, Haddingtonshire, a tree of this variety is 11 ft. in girth at 1 foot, and 9 ft. 6 in. at 5 feet above the ground. It is, however, a good deal disfigured by having lost a heavy limb, which has spoilt the fair proportions of its head and contour. Many large trees of the Norway maple (*A. platanoides*) exist in different parts of the country, but, as it is a distinct species from the sycamore, though resembling it considerably, we have not tabulated its statistics with those of the sycamore.

Before concluding these observations on this interesting and popular tree, we may mention here the account of an experiment made upon it at Carron Park, in Stirlingshire, on 7th and 8th March 1816. "To prove the capability of the sycamore yielding sugar, incisions were made at 5 feet from the ground in the bark of a tree about forty-five years old. A colourless and transparent sap flowed freely, so as in two or three hours to fill a bottle capable of containing 1 lb. of water. Three bottles and a half were collected, weighing in all 3 lb. 4 oz. The sap was evaporated by the heat of a fire, and gave 214 grains of a product, in colour resembling raw sugar, and sweet in taste, with a peculiar flavour. After being kept fifteen months, this sugar was slightly moist on the surface. The quantity of sap employed in the evaporation was 24,960 grains, from which 214 grains of sugar were obtained; therefore, 116 parts of sap yielded one part of sugar."

The commercial value of the timber of the sycamore has advanced very much during recent years, and at some sales of growing trees within the past few years as high as £35 and £40 per tree has been obtained for large trees. It is extensively sought after for the manufacture of printing rollers, and turnery purposes.

APPENDIX.—DESCRIPTION OF THE

County.	Place.	Altitude above Sea-Level.	Soil.	Subsoil.	Exposure of Site.
		Feet.			
Aberdeen, .	Keith Hall, .	200 to 350	Loam, . . .	Hard gravelly, .	Open.
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	,,
Elgin, . .	Brodie Castle, .	100	Black sandy loam,	Gravel, sand, and clay, .	N.E. and open.
Ross, . .	Ardross, . .	450	Black loam, . .	Clayish and hard, .	S.W.
,,	,,	,,	,,	,,	,,
,,	,,	600	,,	,,	,,
,,	,,	800	,,	,,	,,
,,	Brahan, . .	350	,,	Sand and gravel, .	S.
,,	,,	,,	,,	,,	,,
Banff, . .	Gordon Castle, .	70	Dark sandy loam, .	Bluish clay and sand, .	. .
,,	,,	,,	,,	,,	. .
Perth, . .	Fowlis Wester Village, .	About 300	Light sandy, .	Rocky, . .	S.
,,	Abercairny, .	120	Loam, . . .	Clayey, . . .	,,
,,	Redgorton, . .	,,	,,	,,	,,
,,	Castle Huntly, .	65	Deep black loam, .	Gravelly, . .	,,
,,	Balgowan, . .	200	Rich deep loam, .	Red sandstone, .	. .
,,	Birnam, . .	,,	Good light sandy loam, .	Sand and gravel, .	. .
,,	Logiealmond, .	,,	Light loam, . .	Gravelly, . .	. .
,,	Castle Menzies, .	250	Light sandy loam,	Sand, . . .	Open,
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	,,
,,	Scone Palace, .	52	Loamy, . . .	Clay and till, .	,,
,,	Dunkeld, . .	,,	Light loam, . .	Gravel, . . .	Sheltered,
,,	Scone Palace, .	52	Loamy, . . .	Clay and sand, .	S.S.W.
Clackmannan,	Tillicoultry, . .	,,	Light loam, . .	Gravel, . . .	S.

SYCAMORE (*Acer Pseudo-Platanus*).

Height of Tree.	Length of Bole.	Present Circumference of Trunk at			Any former recorded Measurements and Dates.			Diameter of Spread of Branches.	REMARKS.
		1 foot.	3 feet.	5 feet.	Year.	At 1 foot.	At 3 feet.		
Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.		Ft. in.	Ft. in.	Ft. in.	
60 0	20 0	13 0	12 3	11 6	..	..	..	..	Growing in an avenue of 20 trees.
65 0	25 0	12 9	12 0	10 9	..	..	..	..	
60 0	12 0	14 6	14 0	13 0	..	..	..	..	
69 0	20 0	12 7	10 10	10 4	..	..	..	..	Planted between 1650 and 1680.
70 0	14 0	10 9	9 4	8 5	..	..	..	..	All of same age.
75 0	18 0	..	8 4	8 0	..	..	..	..	
55 0	12 0	..	8 0	7 10	..	..	..	..	
45 0	18 0	..	6 6	6 1	..	..	..	..	
80 0	25 0	..	15 3	..	..	..	..	65 0	The girth in 1863 at 2 feet was 14 ft. 6 in. There are some fine large timber trees here.
90 0	25 0	15 10	..	12 3	..	..	..	..	
60 0	..	13 9	..	10 10	..	..	..	..	Circumference of branches, 210 feet.
60 0	..	9 7	..	9 1	..	..	..	..	A beautiful variegated sycamore, with circumference of branches measuring 186 feet.
50 0	14 0	17 1	..	14 0	..	..	..	84 0	A very handsome tree in centre of village.
85 0	25 0	17 0	..	14 4					
88 0	18 0	15 4	..	13 9					
60 0	17 0	13 6	..	12 2	..	..	..	..	The largest and best trees have been mostly cut down here for some years past.
85 0	28 0	20 1	..	15 3	..	..	..	..	A very massive and handsome tree on banks of Tay.
75 0	10 0	23 9	19 9	18 11	1863	..	19 0	72 0	One of the last remains of Birnam Wood.
80 0	28 0	..	..	11 2	..	..	..	..	This tree will girth 11 feet for about 22 feet of its bole in length.
104 3	35 0	25 3	..	18 4	..	..	..	..	In September 1778 this tree girthed 16 feet 8 inches. In open park. Very handsome.
90 0	15 0	32 5	..	17 8	..	..	..	..	One of a row of trees of similar dimensions. It divides into two huge limbs at 15 feet from the ground. Each large trees.
100 0	28 0	18 0	14 2	13 6					
60 0	Short	14 2	..	12 8	..	..	..	..	Said to have been planted by King James VI.
65 0	25 0	..	9 3	..	..	..	..	..	A beautiful upright-growing specimen of variegated variety.
70 0	12 0	14 9	..	13 2	1863	12 0	..	..	Said to have been planted by Mary Queen of Scots.
78 0	30 0	12 10	10 10	..	..	..	..	..	One of three large trees east of garden.

County.	Place.	Altitude above Sea-Level.	Soil.	Subsoil.	Exposure of Site.
		Feet.			
Kinross, . .	Cleish Castle, .	600	Light sandy, . .	Clay and till, .	N.
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	,,
,,	Loch Leven Castle on Kinross and Burleigh, .	550	Light loam, . .	Gravelly, . .	,,
Fife, . .	Aberdour and Donibristle,	20	,,	Friable and gravelly, .	S.
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	,,
Forfar, . .	Kinnaird, . .	30	Sandy loam, . .	Gravel, . . .	E.
,,	,,	90	Light loam, . .	,,	,,
,,	,,	60	,,	,,	,,
,,	,,	,,	,,	,,	,,
,,	,,	50	Sandy loam, . .	,,	,,
	,,	120	,,	,,	Open,
	,,	,,	,,	,,	,,
,,	Gray, . . .	128	Black loam, . .	Sand and gravel, .	Sheltered.
Stirling, . .	Leckie, . . .	..	Light loamy, 14 inches deep,	Red sandstone rock, .	Open,
,,	,,	..	,,	,,	,,
	,,	..	,,	,,	,,
,,	Island of Inchmahome, .	..	Loam, . . .	Gravel and damp clay, . .	W.
Linlithgow, .	Carlowrie, . .	92	Heavy loam, . .	Clay, . . .	S.
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	,,
,,	Niddry Castle, .	225	Good loam, gravelly, .	Clay, . . .	W.
,,	Dundas, . .	130	Light loam, . .	Clay and gravelly,	N.E.
,,	Newliston, . .	120	Good loam, . .	Clayey, . . .	W.
,,	Hopetoun, . .	,,	Light loam, . .	Freestone quarry,	N.
,,	,,	140	Rich loam, . .	Gravelly, . .	,,
,,	,,	,,	,,	,,	,,
,,	,,	120	Loamy soil, . .	,,	Sheltered,
Mid-Lothian, .	Calder House, .	..	Light sandy, .	Clay and gravelly,	W.
,,	,,	..	,,	,,	,,

SYCAMORE—*continued.*

Height of Tree.	Length of Bole.	Present Circumference of Trunk at			Any former recorded Measurements and Dates.			Diameter of Spread of Branches.	REMARKS.
		1 foot.	3 feet.	5 feet.	Year	At 1 foot.	At 3 feet.		
Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.		Ft. in.	Ft. in.	Ft. in.	
70 0	25 0	11 9	8 10	8 0					There are many other large and massive hard-wooded trees here, and a fine avenue of forty old Scotch yews, varying in girth from 10 to 14 feet, and 40 feet high.
65 0	21 0	11 0	8 6	7 4	..	..	..	..	
85 0	40 0	10 9	9 0	8 8					
65 0	18 0	..	12 9	..	..	..	..	..	Believed to have been planted by Queen Mary.
78 0	29 0	16 7	..	13 6	..	..	..	66 0	Three very handsome and vigorous trees, worth for timber from £110 to £120.
74 0	12 0	20 6	..	15 5	..	..	..	72 0	
78 0	30 0	15 5	..	13 2	..	..	..	70 0	
60 0	12 0	16 6	..	13 3	..	..	..	..	A large spreading tree.
50 0	36 0	16 4	..	16 1	..	..	..	..	Getting "stag-horned" at top; ancient appearance.
60 0	15 0	15 0	..	11 9					
60 0	12 0	13 0	..	11 2					
50 0	27 0	13 7	..	10 10	..	..	..	..	A very large and spreading tree.
53 0	12 0	12 8	..	10 0	..	..	..	..	Two noble-looking tall trees, standing in the Deer Park in front of Castle.
55 0	24 0	12 6	..	10 10					
81 0	25 0	15 2	..	12 9	..	..	..	..	Growing on old glebe of Liff, Den of Gray; contains 454 cubic feet of timber.
72 0	24 0	16 10	..	12 10					
80 0	20 0	13 11	..	10 11	..	..	..	..	The soil is shallow, but the trees are perfectly vigorous.
76 0	30 0	11 5	..	10 2					
80 0	..	13 5	11 0	11 7	..	..	..	..	Growing at main west doorway of Priory ruins. Very red bark and dark foliage.
70 0	30 0	13 6	13 0	9 8	In 1870 these measured				Quite vigorous. These trees are examples of many others of similar dimensions. There is a fine old avenue of sycamores here, planted probably about 1550.
65 0	18 0	12 8	11 10	10 7	At 1 ft.		At 5 ft.		
75 0	30 0	11 5	10 10	10 3	12 ft. 8 in.		9 ft. 1 in.		
80 0	35 0	14 6	..	10 6	11 ,, 4 ,,		9 ,, 3 ,,		
					10 ft. 10 in.		10 ft. 3 in.	9 ft. 11 in.	
80	30 0	14 10	..	14 0	..	..	..	..	No. 2 of conical habit. A very handsome tree north of Castle. In 1873, girthed at 1 ft., 14 ft. 6 in.; at 5 ft., 13 ft. 8 in.
82 0	25 0	14 5	..	12 6	..	..	..	..	This tree stands to north of, and near to, the old Norman keep.
85 0	18 0	18 1	11 1	11 0	..	..	..	..	The girth of 11 ft. is maintained throughout the entire length of bole.
80 0	..	15 9	..	15 3	..	..	..	90 0	
58 0	32 0	..	..	9 6					
56 0	25 0	..	..	12 0	..	..	..	84 0	
42 0	..	..	..	7 9	..	..	..	..	A beautifully variegated variety.
80 0	30 0	..	..	10 9	..	..	..	..	There are now no traces of the large sycamore here mentioned by Dr Walker in 1798 and Sir T. D. Lauder in 1826.
65 0	18 0	..	..	10 3	..	..	..	..	

DESCRIPTION OF THE

County.	Place.	Altitude above Sea-Level.	Soil.	Subsoil.	Exposure of Site.
		Feet.			
Mid-Lothian, .	Cramond House, .	50	Light loam, . .	Sand and gravel, .	Sheltered,
,,	,,	..	,,	,,	,,
,,	Cammo, . .	90	Good loam, . .	,,	,,
,,	,,	,,	,,	,,	,,
,,	Craigiehall, . .	85	Good loam (deep),	Clay, . . .	,,
,,	,,	,,	,,	,,	W.
,,	Ingliston, . .	110	Light loam, . .	,,	,,
,,	,,	,,	,,	,,	. .
,,	Little France, .	95	,,	Freestone rock, .	Open,
,,	Corstorphine, .	..	Good loam, . .	Sand and gravel, .	,,
,,	Edmonstone, .	100	Strong loam, .	Shale and blaze, .	. .
,,	Newbattle Abbey,	150	Light sandy, . .	Gravel, . . .	S.W.
,,	,,	150	,,	,,	,,
,,	Woodhouselee, .	700	Light gravelly loam,	Gravel and rock, .	S.E.
,,	,,	730	,,	,,	,,
,,	,,	680	,,	,,	,,
,,	Braehead, . .	70	Loam, . . .	Gravel, . . .	W.
,,	Redhall, . .	400	Poor clay, . .	Till and stones, .	,,
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	,,
East Lothian,	Biel, . . .	150	Sandy loam, . .	Gravel and clay, .	S.
,,	,,	,,	,,	,,	Sheltered,
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	Gravelly, . .	S.
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	E.
,,	,,	,,	,,	,,	Sheltered,
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	W.
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	Sheltered,
,,	Tyninghame, .	50	Sandy, . . .	Sandy, . . .	Open,
,,	,,	,,	Good light loam, .	Gravelly and sandy,	,,
,,	,,	,,	,,	,,	Sheltered,
,,	,,	,,	,,	,,	,,

SYCAMORE—*continued.*

Height of Tree.	Length of Bole.	Present Circumference of Trunk at			Any former recorded Measurements and Dates.			Diameter of Spread of Branches.	REMARKS.
		1 foot.	3 feet.	5 feet.	Year.	At 1 foot.	At 3 feet.		
Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.		Ft. in.	Ft. in.	Ft. in.	
89 0	35 0	18 6	..	14 2	..	..	..	..	A magnificent tree, girths 20 ft. 2 in. round the trunk at the ground line.
75 0	20 0	18 4	..	13 3					
70 0	28 0	16 4	..	14 5					
65 0	20 0	15 6	..	11 6					
70 0	..	13 8	..	12 4					
65 0	..	13 0	..	11 1					
70 0	..	12 10	..	10 2					
66 0	..	11 11	..	9 8					
84 9	20 0	18 0	14 11	14 7	..	..	.	..	Growing on north side of Old Edinburgh and Dalkeith Road, at south foot of Craigmillar Hill, at hamlet of Little France, about 2½ miles from Edinburgh. Remarkable for its bronze-coloured foliage in spring, and its foliation being fully ten days to two weeks earlier than any other.
..	..	..	..	..	..	..	..	..	
83 0	..	..	15 2						
..	..	..	26 6	19 8	..	..	..	..	In 1789, measured 18 ft. 7 in. at 4 ft., and 24 ft. 4 in. at same point as present measurement is taken.
..	12 0	27 0	..	18 3	..	..	..	..	Girths at 10 feet, 22 ft. 8 in.
58 0	8 0	16 1	..	13 4	..	..	..	65 0	Planted probably about the beginning of last century.
68 0	16 0	13 4	..	10 3	..	..	..	..	
79 0	25 0	12 10	..	10 1	..	..	..	..	
101 0	14 0	14 4	..	12 7					
66 0	16 0	15 2	..	11 9	..	..	..	..	Girth in 1798, 9 ft. 4 in. at 4 ft. Mentioned in Dr Walker's list.
75 0	7 0	11 0	..	10 0	..	..	..	..	Girth in 1798, 8 ft. 2 in. at 4 ft. Mentioned in Dr Walker's list. Now slightly decaying.
60 0	..	9 3	..	8 4	..	..	..	..	A beautiful young variegated tree.
75 0	30 0	12 0	..	9 8					
100 0	45 0	11 11	..	8 7					
80 0	35 0	11 3	..	8 9					
85 0	30 0	10 3	..	9 7					
90 0	40 0	12 7	..	9 7					
80 0	18 0	13 8	..	14 3	..	..	..	..	Very picturesque, being strongly gnarled. Head gone and decaying. Girth, 20 ft. at 18 ft. up.
95 0	26 0	15 4	..	10 7			..		
84 0	30 0	16 7	..	10 8					
90 0	15 0	13 0	..	9 7					
70 0	25 0	11 0	..	8 8					
78 0	30 0	14 0	..	10 6					
95 0	35 0	12 4	..	11 6					
100 0	50 0	..	13 0	12 7	..	..	..	..	Girths 12 ft. at 9 ft. from ground.
80 0	37 0	23 6	..	20 10	..	..	..	..	Although quite near the sea, quite vigorous, and do not suffer from its effects either in foliage or healthy growth.
65 0	24 0	17 5	..	12 2	..	..	..	..	
65 0	18 0	12 0	..	9 10	..	..	..	..	
75 0	26 0	11 10	..	9 4					

DESCRIPTION OF THE

County.	Place.	Altitude above Sea-Level.	Soil.	Subsoil.	Exposure of Site.
		Feet.			
East Lothian,	Smeaton, . .	80	Light deep loam, .	Sand and trap-rock,	Sheltered,
,,	Prestonkirk, . .	75	,,	,,	S. and W.
,,	Broxmouth, . .	30	Deep red sandy loam, .	Rock and gravel, .	. .
,,	Whittinghame, .	350	Red clayey loam, .	Sandstone rock, .	Sheltered,
,,	Pressmennan, .	600	Good loam, . .	Clay and gravel, .	S. and E.
,,	Belton, . . .	100	,,	Red sandstone, .	W.
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	,,
,,	Nunraw, near Garvald, .	,,	Red loam, . .	Clay and gravel, .	,,
,,	Dunglass, . .	200	Sandy loam, . .	White freestone rock, .	N.
,,	,,	,,	,,	,,	Sheltered,
,,	Ravenscraig Tower, Cockburnspath, .	250	,,	,,	S.
,,	,,	,,	,,	,,	,,
,,	In village of Cockburnspath	,,	,,	,,	E.
,,	,,	,,	,,	,,	W.
,,	Yester, . . .	450	Strong loamy clay,	Old red sandstone,	S.W.
Berwick, .	Kimmerghame, .	,,	Black loam, . .	Strong, red, and clayey, .	W.
,,	Thirlstane Castle,	,,	Clay loam, . .	Till, . . .	,,
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	,,
,,	Nisbet, . . .	,,	Loamy, . . .	Sand and clay, .	E.
,,	,,	,,	,,	,,	S.
Roxburgh, .	Cavers, . . .	,,	,,	Clay, . . .	,,
Peebles, . .	Dawick, . .	800	Light sandy, . .	Rocky and clay, .	. .
,,	Stobo, . . .	745	Black loam, . .	Blue till, . .	E.
Dumbarton, .	Cameron House, .	120	Peaty loam, . .	Gravelly, . .	W.
,,	Camis Eskan, .	70	Light loam, . .	Sand and gravel, .	,,
,,	Rossdhu, . .	200	,,	Gravelly, . .	. .

SYCAMORE—*continued.*

Height of Tree.	Length of Bole.	Present Circumference of Trunk at			Any former recorded Measurements and Dates.			Diameter of Spread of Branches.	REMARKS.
		1 foot.	3 feet.	5 feet.	Year.	At 1 foot.	At 3 feet.		
Ft. in	Ft. in.	Ft. in.	Ft. in.	Ft. in.		Ft. in.	Ft. in.	Ft. in.	
78 0	30 0	18 4	..	11 10					
90 0	15 0	15 5	..	12 0	..	..	..	..	Growing on river side near churchyard. Divides at 15 ft. into one main stem and five other very large limbs.
100 0	50 0	16 0	..	15 2	..	..	..	..	Many sycamores of similar size, and varying in boles from 24 to 50 ft. in length.
75 0	25 0	18 10	..	13 4	..	..	..	..	A beautiful park tree.
60 0	18 0	11 4	..	9 7	..	..	..	65 0	A noble tree at so high an altitude, dividing into two great limbs at 18 ft.
90 0	12 0	12 11	..	9 10	..	..	..	..	These are fair examples of many others growing here, quite within reach of the sea breeze and winds off the North Sea, and quite vigorous.
82 0	18 0	12 6	..	9 10	..	..	..	..	
85 0	15 0	12 0	..	9 10	..	..	..	..	
90 0	12 0	11 6	..	11 4	..	..	..	..	A noble tree, with close foliage. It branches into three huge limbs, at 12 ft. from ground.
60 0	17 0	13 10	..	12 6	..	..	..	..	Girths 12 ft. at 17 ft. from ground.
70 0	12 0	..	..	13 0	..	..	..	..	Girths 12 ft. 4 in. at 8 ft. up, and then at 12 ft. goes into two huge limbs.
75 0	6 0	13 3	..	13 8	..	..	..	60 0	Divides at 6 ft. into two main limbs 8 ft. 2 in. and 8 ft. 8 in. in girth respectively.
70 0	15 0	9 4	..	8 8	..	..	..	..	Growing within 3 ft. of the preceding.
90 0	10 0	11 5	..	11 2	..	..	..	..	These two trees stand opposite each other on each side of the road running through the village. Very picturesque and vigorous trees.
87 0	10 0	11 8	..	11 0	..	..	..	..	
85 0	..	19 3	..	15 0	..	..	..	..	A very majestic tree.
80 0	..	12 6	11 2	11 0					
63 0	28 0	16 4	..	16 2					
60 0	24 0	14 3	..	13 8					
74 0	18 0	14 6	..	14 5					
75 0	..	..	..	..	1795	..	12 3	..	This tree is recorded by Dr Walker in 1795, and by Sir T. D. Lauder in 1826.
65 5	..	..	..	..	1795	.	8 6	..	Do. Do.
56 0	25 0	14 2	..	11 6	..	..	..	..	A fine umbrageous specimen.
..	..	..	..	..	1826	..	15 0	..	Recorded by Sir T. D. Lauder.
63 0	16 0	19 0	..	17 8	..	..	..	..	Very handsome and vigorous.
75 0	25 0	16 8	..	14 8	..	..	..	..	There are several of similar sizes.
80 0	13 0	18 2	..	15 6	..	..	..	..	In 1870 girthed 15 ft. at 5 ft. high.
85 0	20 0	22 0	17 0	15 5	1796	..	13 6	..	In 1863 it girthed 21 ft. at 1 ft. high; 16 ft. at 4 ft.; 15 ft. at 6 ft.

DESCRIPTION OF THE

County.	Place.	Altitude above Sea-Level.	Soil.	Subsoil.	Exposure of Site.
		Feet.			
Dumbarton, .	Rossdhu, . .	200	Light loam, . .	Gravelly, . .	. .
Renfrew, .	Houston Place, .	60	Light gravelly, .	Rotten whinstone,	. .
,,	Hawkhead, . .	. .	Good loam, . .	Till and gravel, .	. .
,,	,,	. .	,,	,,	. .
,,	,,	. .	,,	,,	. .
Argyll, . .	Benmore, . .	50	Deep dark soil (dry)	Gravel, . . .	W.
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	,,
,,	,,	,,	,,	,,	,,
,,	Inveraray Castle, .	. .	Sandy loam, . .	,,	Open,
Ayr, . .	Glendoune, . .	131	Good loam, . .	Sand and gravel, .	W.
,,	,,	,,	,,	,,	,,
,,	Loudoun Castle, .	400	Light loam, . .	Loose limestone, .	Open,
,,	,,	,,	,,	,,	,,
,,	,,	333	Black loam, . .	Clayey, . . .	W.
,,	Cassillis House, .	180	Light loam, . .	Trap rock, . .	S.
,,	,,	,,	,,	,,	N.W.
,,	,,	,,	,,	,,	,,
Dumfries, .	Kirkconnell, . .	. .	,,	Gravel and clay, .	. .
,,	Lockwood, . .	900	Light sandy, . .	Gravel, . . .	S.
,,	(Old Plumbery Castle, .)	. .	,,	Damp clay, . .	. .
Kirkcudbright,	Hopehead, . .	. .	Sandy loam, . .	Rock and gravel, .	Open.
North Wales, .	Hafodunos, . .	750	Poor loam, . .	Clay-slate, . .	S.W.
,,	Wygfair, . .	400	Light loam, . .	Stiff clay, . .	. .
,,	Bachymbyd, . .	. .	Rich loam, . .	Blue shaley gravel,	. .
,,	,,	. .	,,	,,	. .
,,	Kinmel Park, .	300	Strong loam, .	Clay, . . .	. .
,,	,,	,,	,,	,,	. .
Somerset, .	Dunster Castle, .	. .	Good loam, .	Clay and sand, .	.

SYCAMORE—*continued.*

Height of Tree.	Length of Bole.	Present Circumference of Trunk at			Any former recorded Measurements and Dates.			Diameter of Spread of Branches.	REMARKS.
		1 foot.	3 feet.	5 feet.	Year.	At 1 Foot.	At 3 Feet.		
Ft. in.	Ft. in.	Ft. in.	Ft. in.	Ft. in.		Ft. in.	Ft. in.	Ft. in.	
70 0	15 0	15 2	..	13 6	..	..	..	..	Remarkably dense foliage, stands in front of stables.
50 0	12 0	..	16 10	..	1863	..	15 6	74 0	A magnificent tree, occupying about 500 sq. yds. of ground.
80 0	15 0	..	..	17 4	..	..	..	70 0	A very handsome specimen.
73 0	20 0	..	..	12 3	..	..	..	60 0	
60 0	14 0	..	..	10 10	..	..	..	48 0	
55 0	15 0	12 9	..	9 8	..	..	..	..	Sycamore grows freely in this situation, near the sea-level, and there are many trees of great age. Those recorded in this Table are a very fair average of many others on the estate. There are some similar trees about Inveraray Castle.
60 0	18 0	10 8	..	7 9	..	..	..	..	
70 0	20 0	10 8	..	8 8	..	..	..	..	
55 0	20 0	12 10	..	10 9	..	..	..	..	
60 0	20 0	9 10	..	8 6	..	..	..	..	
80 0	20 0	..	13 2	..	1863	..	13 0	..	Showing symptoms of decay.
50 0	10 0	21 0	..	13 0					
70 0	25 0	18 0	..	18 0					
75 0	9 0	18 4	..	13 4	..	..	..	..	Divides into two stems (very large) at 9 ft.
65 0	7 0	17 5	..	12 5	..	..	..	..	A very handsome tree.
70 0	20 0	15 3	..	11 10	..	..	..	..	Do. do.
69 0	8 6	18 4	..	13 3	..	..	..	76 0	The "Dool Tree."
77 0	21 6	12 3	..	10 2	..	..	..	..	Grows near Cassillis House.
85 0	17 0	17 0	..	11 10	..	..	..	..	Grows near the stables.
45 0	10 0	19 11	..	15 6	..	..	..	..	A very large tree. Overhangs the chapel in part.
70 0	14 6	17 7	..	13 4	1773	..	8 9	..	Recorded by Prof. Walker in 1773, and was 50 ft. in height.
97 0	23 0	29 0	..	16 0	..	..	..	81 0	Grows 150 yards N.E. from the Castle.
40 0	10 0	14 6	..	13 0	..	..	..	70 0	Is called "the Hopehead Tree," and is a sort of landmark. Is a complete mushroom in appearance, with short stem and round head.
60 0	..	14 9	..	10 4	..	..	..	..	Thriving at such an altitude.
65 0	..	15 0	..	11 0					
80 0	..	17 0	..	13 1	..	..	..	..	Growing behind mansion-house. Very fine solid and good trees. The date on mansion is 1666.
78 0	..	14 9	..	11 7	..	..	..	..	
70 0	6 0	14 0	..	14 0	..	..	..	60 0	Fine park tree specimens.
73 0	7 0	19 0	..	13 9	..	..	..	65 0	
55 0	..	18 3	..	16 11	..	..	..	..	Growing out of the base of a cross at the ruins of Cleeve Abbey, an old Cistercian monastery, and near a very handsome walnut tree.

ON THE *ABIES ALBERTIANA*, AND ITS VALUE FOR PLANTING IN SCOTLAND.

By Robert Hutchison of Carlowrie.

[*Premium—Medium Gold Medal.*]

Abies Albertiana (Murray), Prince Albert's Spruce.

Synonyms—*Abies* (*Tsuga*) *Albertiana*, Murray; *Abies taxifolia*, Jeffrey: *Abies Mertensiana*, Gordon; *Abies Bridgeii*, Killogg.

Specific Character.—A hemlock spruce attaining about 100 feet in height, of dark rich verdure when near maturity, and of very graceful habit and appearance. In young plants the verdure of the foliage is not dark, but of a lively green hue, which deepens with the age of the tree.

Branches.—Long, flexible, and slender.

Branchlets.—Cylindrical pendent at the extremities; villous, the pulvini very slightly prominent.

Leaves.—Green; glaucous beneath; irregular in size, from about $\frac{1}{3}$d to $\frac{3}{4}$ths of an inch in length, and $\frac{3}{4}$ths of line broad; solitary, growing spirally round the branch, but also disposed somewhat alternately; flat, very slightly canaliculate on the upper side, and midrib on under; obtusely pointed and not emarginate at apex, petiolate at base. Above without stomata, but underneath with from 5 to 7 rows of stomata close to each side of mid-rib, covered with a beautiful silvery pulverescence, and having a broad margin without stomata.

Catkins.—Not yet sufficiently observed in British specimens.

Cones.—About an inch in length; of a pale brown colour; oblong-ovate; narrow, with six rows of scales, 5 in a row, spirally arranged.

Scales.—Pale brown at apex, deepening into a most beautiful purple brown: persistent, oblong-oval, smooth, and few in number.

Seeds.—Of light brown colour; small, with wings $\frac{1}{4}$th of inch long and whitish.

Bark.—Smooth and light-coloured.

A tall handsome tree, attaining about 100 feet in height, with a straight stem of uniform size for about two-thirds of its height.

Habitat.—Oregon; Northern California; in British Columbia, where it forms vast forests; and in Vancouver's Island.

The conflicting nomenclature so common and confusing to arboriculturists in the coniferous genus, receives no more striking illustration than in the case of this pine,—*Abies Albertiana*, or Californian hemlock spruce, as most botanists prefer to style it, in distinction to its prototype the *A. Canadensis*, or Canadian hemlock spruce, to which it is very closely allied, and resembles strongly in its main characteristics. The latter spruce has been long known and cultivated, though not extensively, in Scotland, having been introduced to Britain in 1736. It is chiefly found planted singly, and in isolated situations, having been evidently regarded from its introduction, and probably from the reputation of its timber qualities in its native habitats, rather as an ornamental than as a commercially valuable tree for this country.

The *A. Albertiana*, however, though so closely resembling that and other allied species, such as *A. Mertensiana*, *A. Pattoniana*, and more distantly *A. Hookeriana*, is, on minute examination, unquestionably a distinct species, although it is an undoubted fact that quantities of the *A. Albertiana* have been distributed under the synonym of *A. Mertensiana*, and also, but less generally, under that of *A. heterophylla*.

Such confusions of names are often very misleading, and it would be a matter of great satisfaction to botanists if a thorough revisal of the whole catalogue of the more recently introduced coniferæ, and a general consensus of agreement were arrived at, upon only one distinguishing name in each case. No doubt many botanists suppose that *A. Albertiana* is identical in every particular with *A. Mertensiana*. This is, however, erroneous, and although differing from so very eminent an authority in matters coniferous as Gordon, we prefer agreeing with the late Mr Andrew Murray in considering the two pines distinct; and the reasons for the cause of the confusion may be explained when the history of the introduction of the *Albertiana* is referred to.

The *A. Albertiana* seeds were first sent home to this country by Jeffrey in his first Oregon Expedition of 1850. Some of the earliest cones were sown by the late lamented Mr Patton at The Cairnies, in Perthshire, in 1851, and to these and their progress reference will be again made in this paper. Jeffrey, in describing this Californian hemlock spruce, in transmitting it home, called it inadvertently *A. taxifolia*; but this was at once seen to be a misnomer, and the pine proving to be a distinct species, received the name of *Albertiana* in deference to the late Prince Consort. *A. Mertensiana*, about the same time, arrived from the island of Sitka: and, as a settlement of the difference, botanists generally agreed that, while both are hemlock spruces, as is also the Canadian and older species, the three might be held as distinct representatives of the species in their respective countries and latitudes. In 1861, on the fresh receipt of seeds in Britain, it would appear that the *A. Albertiana* was again subjected to examination, and these were accordingly distributed under the name of Bongard's *A. Mertensiana* of Sitka, probably on Gordon's authority for identification, although they were undoubtedly identical with, and from the very same Californian habitats, and, for aught that is known, probably from the very same trees as the original and first introduction of Jeffrey ten years previously. Hence the confusion. While *A. Canadensis* is quite different in habit, being much more bushy and shrubby in its foliage, and easily distinguishable, *A. Albertiana* and *A. Mertensiana* are more closely allied in appearance, but differ on minute examination in the scales of their cones, which vary in form, and also in the *pulvini*,—those on *Albertiana* being small and widely

apart, while those on *Mertensiana* are found to be unusually close together.

Named in memory of the late lamented Prince Consort, and in recognition of his skill and zeal in forming the fine collection of coniferous plants at Osborne, this pine, on its extended introduction from British Columbia by Mr Brown in 1861, at once became a popular favourite with pine growers. It has not, however, been as yet widely planted for profit; but its great beauty and graceful habit have secured for it a place in almost every ornamental collection in Britain. It has proved itself quite hardy in most situations, and is not particular as to soil or exposure. It appears, like all the other species and varieties of the spruce family, to thrive most luxuriantly when planted in a cool moist soil, but succeeds very well also on peat bog. Some of the finest specimens to be met with in this country are growing in soil of a deep loamy nature, on a gravelly porous subsoil. Reference to the table appended to this paper will give details of the progress of some thriving examples throughout various parts of Scotland, and particulars of their conditions. There can be no doubt that *A. Albertiana* is quite hardy in this country; and it is owing to the scarcity of seeds during the early years of its first discovery in 1851 that taller specimens are scarce in Scotland, the majority of those now to be found in most situations being the produce of those importations in quantity sent by Mr Brown of the British Columbian Expedition in 1861 and 1862. It does not appear to be injuriously affected by extreme elevation in this country, after the young plants are thoroughly acclimatised, for it is found at Hafodunos, in Abergele, Denbighshire, thriving admirably at an altitude of from 700 to 800 feet above sea-level: and on the Kilmun Estate, in Argyleshire, it is making rapid growths in all situations, at altitudes varying from 10 to 500 feet. In this locality it does not seem to like the strong cutting winds which prevail from west and north-west; and in situations exposed to these points its growth is less rapid, and its slender top shoot is liable sometimes to be snapped over. The plan adopted on this well-managed estate, in planting this and other varieties of the newer conifers, is to establish the young plants during their infancy in seedling rows in a home nursery, whence they are afterwards removed, with a little soil adhering to their rootlets, and planted into pits on the hill-sides previously prepared for them, and into which, if the situation be very stony and rocky, some good soil has been put. This plan is, however, open to the objection that, in situations not adapted for it, a rapid or forced growth is induced, rendering the trees, in sites open to the prevailing winds, liable to lose their leading shoots of young wood. At Hawkstone Park, North Shropshire, at an elevation of 1000 feet, this and

many other of the newer coniferæ thrive well in light loam on sand, and there are fine plants of the various species from 12 to 40 feet in height. At Buckden, Skipton, Yorkshire, at an altitude of 890 feet, on a thin light soil on mountain freestone, it is in perfect health and very symmetrical. In all these high situations, however, it should be mentioned that the *A. Albertiana* and other coniferæ are not exposed to much wind. At Kinmel Park, near Abergele, the *A. Albertiana* was planted in 1870, and has flourished well, growing at the rate of a foot annually, after the first year. It succeeds there much better than *A. Canadensis* in a strong loam soil, on a clay subsoil, and adjoining the limestone formation. At Strathfieldsay, Hampshire, there are numerous plants which have been planted in 1861, and are in perfect health and growing rapidly. The soil is a red clay, and is gravelly, on gravel subsoil. Although in that district the *A. Albertiana* is thriving in such soil, yet it is observed there to do better in a sheltered site, and on deep moist loamy patches it makes more wood in a shorter space of time. It is found to thrive also in the stiff clay overlying the Bagshot sands, at an altitude of 300 feet. There is no comparison between the growth and habit of the *A. Albertiana* and *A. Canadensis*, and numerous places afford examples of the better suitability of the former, and its superior tree form, for this country. For example, at Wygfair, near St Asaph, at an altitude of about 500 feet, the *A. Albertiana* are now fully six feet in height, and are succeeding very well, making fine annual shoots, of graceful pendulous form, which afterwards ripen into leaders as straight as an arrow, and as flexible as a piece of whalebone, while its prototype the *A. Canadensis* is a mere dense shrubby bush, and like the *Cryptomeria* in this situation is constantly affected by the frosty winds; but the other less hardy species of coniferæ, such as *Cupressus macrocarpa*, seems to like the situation, and even at so high an altitude are succeeding very well. It should be stated that this site is exceptionally well-sheltered from winds, though the ranges of temperature are sometimes extreme. At Milton Abbey, in Dorsetshire, the *A. Albertiana* has, in common with various other coniferæ, been planted without success. It will not live in the chalk and flint soil there. Indeed, this soil is very unfavourable for the pine tribe generally. Even *Pinus sylvestris* does not thrive. Although planted from home-nurseries there, one out of three dies; and *P. Austriaca*, *Cedrus deodara*, and others, will grow for twenty years luxuriantly, and to all appearance quite healthily, when they suddenly die off. In this district, and on this peculiar soil, the common yew, and the *Araucaria imbricata* both thrive amazingly. At Garnstone, Weobly, Herefordshire, there are some fine healthy specimens of this pine planted close under the north side of a steep hill, in a very cold

situation, which is much exposed to the winds of winter and spring, and beside its congener *A. Canadensis*, which was planted about thirty years ago, and is now about 40 feet high, with a girth of 8 feet 6 inches round the trunk at a foot from the ground.

The *A. Albertiana* appears well-adapted for the moist climate of Ireland. Indeed, many of the more recently introduced coniferæ of late years might be planted there profitably for timber purposes. On the Church-hill estate, at Verner's Bridge, Moy, this pine is thriving splendidly. One fine specimen there, planted in 1866, is now (1879) fully 30 feet high, and measures in circumference, at 1 and 3 feet respectively, 2 feet 10 inches and 2 feet. The altitude is 80 feet, and the situation is moderately sheltered with a north-eastern aspect; the soil is clay loam, resting on a clay subsoil, naturally slightly damp, but thoroughly drained. There are also other thriving specimens in that neighbourhood, growing in a deep peat bog soil with a clay substratum.

But we must proceed now to notice some of the specimens growing and thriving in various localities in Scotland, and we need have little hesitation in placing the trees at The Cairnies and Glenalmond, Perthshire, in the foremost rank of specimens of *A. Albertiana*. The well-known enthusiastic interest of the late Mr George Patton of The Cairnies secured for him, from all quarters, the earliest importations of seed of this and many other species of coniferæ, and the collection which he thus formed,—fostered by a singularly suitable soil and situation,—contains some of the best examples in the country of the various acquisitions of recent years to our coniferous sylva in Scotland. Two magnificent specimens of *A. Albertiana* far outstrip all others at The Cairnies. Growing at an altitude of 660 feet, in a thin moorish soil, on a subsoil of hard retentive clay, and with a southern exposure, they are now 46 feet in height, and girth 5 feet 4 inches at 1 foot from the ground, and 4 feet 5 inches at 5 feet, with a spread of branches measuring 40 feet in diameter. They were planted twenty-eight years ago, from the first importation of seeds which arrived in 1851. These specimens, which had in the winter of 1860–61 attained a considerable height (20 feet), withstood the severity of that memorable year with impunity, but the young stock growing at The Cairnies was killed outright, being too small to reach their tender young leaders above the dewline. At Moncreiffe House, Perth, there is a fine *A. Albertiana*, planted, in 1868, in a light loam on till and freestone, it is growing very rapidly, having already attained a height of 28 feet, and girth 2 feet 2 inches, and 1 foot 10 inches at 1 foot and 5 feet from the ground. Mr Bissett, the intelligent gardener there, reports it to be the fastest grower he has planted of the coniferous tribe, and from its closely jointed branches and their small diameter,

compared with that of the stem, he anticipates it will produce good timber. Other good examples of this conifer exist in Perthshire, where, indeed, this family find probably their most congenial habitat in Scotland, and appear to thrive better than in other and seaboard counties. At Abercairny, near Crieff, although the trees have only been eight years planted, some are already 16 feet high, and many others from 10 to 12 feet (altitude of site, 120 feet). At Milne-Graden, Berwickshire, at an altitude of 100 feet, there is a very handsome tree, now 42 feet in height, and girthing, at 3 feet from the ground, 2 feet 10 inches; the soil is light loam on clay. The finest examples of *A. Albertiana* in the district of the Stewartry of Kirkcudbright are to be found at Munches, near Dalbeattie. There they are doing equally well in various kinds of soil,—moss, clay, gravelly,—on granitic rock formation. In this situation, in garden soil, we find one tree, about twenty years old, already 41 feet in height, and girthing, at 1 foot and 5 feet from the ground, 3 feet 3 inches and 2 feet 6 inches respectively. Another, in a plantation, and of same age, is 39 feet high, and 3 feet 5 inches and 2 feet 5 inches in girth at the same points of measurement. On the Red Sandstone rock formation of East Lothian, near the sea, it also seems to thrive well. At Smeaton, near Prestonkirk, in that district, there is a fine specimen, now fully 20 feet high, growing at an altitude of 90 feet in a good black loam soil upon gravelly subsoil, on the Red Sandstone formation. At Loganbank, in the central district of Mid-Lothian (altitude 700 feet) *A. Albertiana* thrives well in a light sandy clay soil on yellow clay bottom; and in 1878 two specimens measured as follows:—No. 1, 29 feet in height, and at 1 foot from the ground 2 feet 10 inches in girth. No. 2, 26 feet high, and 2 feet 2 inches at 3 feet from the ground. Both trees have been planted within twenty years. At Newbattle, Mid-Lothian, *A. Albertiana* is quite hardy, and is making very rapid growths of young wood annually. Many plants placed there within a few years are already above 12 feet high. The soil is good loam on gravel. At Carlowrie, West Lothian, *A. Albertiana* has been planted in good deep alluvial loam, on a clayey retentive subsoil, and has made good progress,—the plants are still young, but are making vigorous annual shoots of fully a foot in length. They are now about 15 feet high, and have been only eight years planted. The severity of last winter in this situation, which is low lying, being only 92 feet altitude above sea-level, and quite close to the bed of the river Almond, tested the hardihood of the newer coniferæ very smartly, and *A. Albertiana*, about 15 feet high, has lost its leading shoot and nearly all its young wood. This damage was occasioned not so much by the number of degrees of frost as by the bright sunshine during the month of March, after one or two nights

of extremely low temperature, accompanied by thick white *häar*, which quite enveloped the smaller plants and shrubs. In positions shaded from the sun's rays, *A. Albertiana* was quite uninjured; and this was the more apparent where the soil was lighter, and the situation was more open round the plants, for there they had ripened the young wood of the previous year's growth more thoroughly. In the northern districts of Scotland, also, the *A. Albertiana* proves itself quite hardy, and in good drained subsoils quite suitable for more extensive introduction. In exposed situations in Aberdeenshire; at Keith Hall, for example, it is sometimes browned by the late spring frosty winds, and does not seem to be so well-adapted for these districts as the *Picea nobilis*, with which it is found growing in company. It does not develop so thick a bole as the *P. nobilis* in the same space of time. For instance, in this site, in low lying bog-earthy soil near the river side, with a loose gravelly subsoil, the *A. Albertiana* is now 18 feet in height, 11 inches in circumference at 1 foot up, and 7½ inches at 5 feet up the stem, while the *P. nobilis* has attained the same height, though somewhat older planted,—but with a girth of 1 foot 6 inches at 1 foot up, and of 1 foot 2 inches at 5 feet from the ground. At Kingswells, near Aberdeen (altitude, 600 feet), the *A. Albertiana* grows rapidly, but is sometimes cut back in its young shoots by spring frosty nights, followed by sunshine during the daytime.

It is difficult to say what the prospective value of *A. Albertiana* as a timber producing tree in this country may be. It will have been observed, from the dimensions of the largest specimens we have been able to find in Scotland (as shown in Table I. on the following page), that many years must elapse ere proof of the quality of its timber can be obtained. Meantime, it may be said that, while sufficiently hardy for our climate, it is also a rapid grower when fairly established, is not fastidious as to soil or altitude, and from its general appearance and habit, and examination of the texture of the wood from the stem of young trees, appears to warrant the hope that in a short space of time *A. Albertiana* is capable of producing, similarly to the larch in this country, timber of close-grained well-packed texture and quality; while its bark may further render the tree valuable by being profitably used for general tanning purposes.

In Table I. are exhibited the progress and statistics of the *Abies Albertiana* in Great Britain: while in Table II. some facts are tabulated relative to several specimens of *Abies Canadensis* (a closely allied species) cultivated successfully in this country. In connection with the latter, it may be stated that in the beautiful collection at Chatsworth, Derbyshire, *Abies Albertiana* has no representative, but there are examples in quantity of the species *A. Canadensis*, varying from 30 to 80

TABLE I.—Progress and Statistics of Abies Albertiana in Britain.

County.	Place.	Altitude above Sea Level.	Soil.	Subsoil.	When Planted.	Height of Trees.	Girth at 3 feet.	REMARKS.
		Feet.			Years.	Feet.	Ft. in.	
North Shropshire,	Hawkstone Park,	1000	Light loam,	Sand,	Various	12 and 40	..	Quite hardy.
Yorkshire,	Buckden,	890	Thin light soil,	Mountain freestone,	,,	Various	..	Thriving, and very symmetrical.
Denbigh,	Kinmel Park,	..	Strong loam,	Clay,	1870	,,	..	Growing rapidly. Succeeds better than *Abies Canadensis*.
Hants,	Strathfieldsaye,	..	Red clay,	Gravelly,	1861	,,	..	In perfect health.
Armagh (Ireland),	Church-hill,	80	Shallow and boggy,	Stiff blue and yellow clay,	1866	30	2 10	A splendid specimen.
Perth,	The Cairnies,	660	Thin moorish,	Hard retentive clay,	1851	46	5 4	Very vigorous. Diameter of spread of branches 40 ft.
,,	Monereiffe House,	90	Light loam,	Till and freestone,	1868	28	2 2	A rapid grower, and very hardy.
,,	Abercairny,	120	Loamy,	Gravel,	1870	16	...	Thriving remarkably well.
Berwick,	Milu-Graden,	100	Light loam,	Clay,	,,	42	2 11	Very handsome.
Kirkcudbright,	Munches,	..	Moss,	Clay,	1858	41	3 3	Vigorous. Thrives here in various soils.
,,	,,	..	Clay, gravelly,	Clay,	,,	39	3 5	,, ,, ,,
East Lothian,	Smeaton,	90	Good black loam,	Gravelly,	1861	20	..	Quite luxuriant.
Mid-Lothian,	Loganbank,	700	Light sandy,	Yellow clay,	1858	29	2 10	Thriving well.
,,	,,	,,	,,	,,	,,	26	2 2	,,
,,	Newbattle,	..	Good loam,	Gravelly,	1868	About 12	..	Is very thriving and a rapid grower.
West Lothian,	Carlowrie,	92	Heavy loam,	Clay,	1870	15	..	A very rapid grower in this site and soil.
Aberdeen,	Keith Hall,	..	Bog, earthy, and sandy,	Loose gravelly,	1865	18	0 11	Sometimes browned in its young wood by spring frosts.

TABLE II.—Progress and Statistics of several old Abies Canadensis referred to in foregoing Paper.

Derby,	Chatsworth,	450	Strong hazel loam,	Yellowish, sandy,	..	30	.	
,,	,,	,,	,, ,,	,, ,,	..	80	..	Various fine specimens here.
,,	,,	,,	,, ,,	,, ,,	..	100	..	
Perth,	Keir,	600	Good loam, free and dry,	Clay and gravel,	..	50	16 ft. 7 in. at 1 ft.	Two fine specimens, about same size, girth 5 feet 8 in. at 6 feet.
,,	Dunkeld,	..	Light loamy soil	Damp gravelly,	..	80	19 ft. 10 in. at 5 ft.	A splendid specimen—probably the largest in Scotland.

and 100 feet in height, growing luxuriantly at an altitude of 450 feet on a strong hazel loam soil, with a poor yellowish sandy subsoil, and Mr Speid reports its wood as "hard" and "heavy."

Several other instances and details of growth of the *A. Canadensis* might not be inappropriate to a paper devoted to the progress of its close congener, *A. Albertiana*, but we shall only cite one or two by way of illustration of the adaptability of the hemlock spruces generally to the climate of Scotland. At Keir, Stirlingshire, there are two fine specimens, measuring 50 feet in height, and 6 feet 7 inches at 1 foot from the ground, and 5 feet 8 inches at 6 feet from the ground. At Dunkeld, in the Duke of Athole's woods, near the Hermitage Bridge, there is probably the tallest specimen of *A. Canadensis* in Scotland. Measured in August 1879, it was then 80 feet in height, and girthed 9 feet 10 inches at 5 feet from the ground. It grows in a light loamy soil, on a damp gravelly bottom, and forms a very picturesque and beautiful tree, its foliage being so distinct in colour and outline, amid the dark evergreen spruces and Scots firs of its neighbourhood. The wood of this spruce is said to be brittle and soft, and of small value in its native habitat in Canada, but its bark is invaluable for tanning purposes, and is said to contain a larger percentage of "tannin" than even the best oak or larch bark of any country.

ON THE EFFECTS OF THE SEVERE FROST AND WINTER OF 1878–79 ON TREES AND SHRUBS.

By Robert Hutchison of Carlowrie.

[*Premium—The Medium Gold Medal.*]

The effects upon trees and shrubs of the frost of the memorable winter and spring of 1860–61, and particularly upon the more recently-introduced denizens of other countries, have already been recorded in the "Transactions" of this Society, and it is fitting and proper that the effects of another season of almost unprecedented severity, and so closely resembling in its results that of 1860–61 should not be allowed to fade from memory unchronicled in the annals of the Society. In many respects the winter and spring of 1878–79, in Scotland, were similar to those of 1860–61;—the severity of the frost in its intensity differed only in degree, in many places the temperature of the latter-mentioned season having been considerably lower, over a more generally diffused area, than was the case last year.

while, to mitigate the amount of cold, the winter of 1878-79 was favoured with a heavier and longer-continued snowfall than was experienced in 1860–61;—so that, upon the whole, it may be safely stated that shrubs, evergreens, trees, and indeed vegetable and animal life generally, suffered less last year than in 1860-61. Traces of the disastrous season, now nineteen years gone by, still remain in the mutilated forms and appearance of many trees and specimen evergreens all over the country; and although neither so general nor so marked in degree, still it is to be feared that in some localities, where the special geographical contour of the situation was favourable to the hostile action of extremes of temperature, the injury done by the winter and spring of 1878-79 will be long a noticeable feature on many trees and shrubs, while in a few peculiarly exposed places some specimens have been killed outright. It may seem strange to say in a season like last winter, which we have admitted to be less severe than that of 1860–61, although in some instances *Araucaria*, *Deodara*, *Taxodium sempervirens*, *Wellingtonia gigantea*, common hollies, laurels, and even *Rhododendron ponticum*, and other shrubs and trees survived the greater number of degrees of frost in 1860–61, yet these very specimens suffered more severely, and have been in some instances even killed by the winter of 1878–79. This was, no doubt, owing to the more protracted and persistent recurrence of the frost, accompanied by severely cutting easterly winds and bright sunshine during the day, which prevailed far into the spring months, as we shall have occasion again to refer to, and which was a feature not present in 1860–61. The preceding autumn months having been dry and warm, and favourable to the mature ripening of the annual growth of young wood, rendered trees and shrubs better able to withstand the severe winter of last year, and to this circumstance may be due the record of fewer casualties than in 1860; but, on the other hand, the wet and sunless summer they have just passed through, has militated severely against the recuperative efforts of Nature upon those trees and shrubs which were sufferers from the frost, and should this winter again prove a hard one, with low temperature, many plants supposed to have been only temporarily injured may yet have to be added to the catalogue of those totally killed from the effects of 1878–79.

For five long dreary months,—from November to April,—frost and snow held Nature in their continued grasp over the entire area of the country. The variations in the weather for the period may be thus generally stated: From the middle of November 1878 the season assumed a truly wintry aspect. Frost prevailed and chill winds, with little sunshine. From the first week in December till the 14th of February, snow lay generally over the country to a depth of about from 4 to 6 inches on

the low grounds, to nearly 16 inches on high and exposed localities, and to a still greater depth on hilly lands and in the valleys and gorges of the northern mountain ranges of Scotland, The wind had, about the beginning of February, gone round to the west, and on the 14th of that month a sudden rise of the thermometrical readings at most stations gave indications of the long-wished for change to milder weather being at hand, when, unfortunately, a sudden change of wind to the east again took place, snow and sleet again drifted from heavy banks of clouds across the face of the country, and the hopes of an early spring of the day before were as suddenly and as quickly blasted as they had been previously entertained and excited. A heavy snow-storm set in on the 15th and 16th, more severe than had before been experienced during the winter, and was accompanied by remarkably low readings of the temperature. In many instances the thermometer stood at zero on different nights between the 16th and 20th February. These nights being calm, and the heavy snowfall continuing at brief intervals, the depth attained was considerable, being from 14 inches on low grounds to 3 feet on open places at an altitude of 1100 feet above sea-level in the Highlands. This heavy snow-storm was very general over the whole country, and continued undisturbed on wood and field for about ten days, during which the atmosphere was clear and calm. A striking phenomenon noticed at this time, in open situations, and wide straths like that stretching from Corstorphine, a few miles west of Edinburgh, as far as Broxburn and Uphall, was the distinctness with which distant sounds were carried and heard far off, such as vehicles travelling along distant roads, trains, machinery in motion, and so forth. This same peculiarity was observed in the winter of 1860–61, and was doubtless due to the highly rarified condition of the atmosphere. Although the friendly mantle of fleecy snow was of material assistance in protecting vegetable life in its smaller forms of plants and shrubs, and although the beauty of the fresh-fallen spotless mantle on every twig and stem lent to the woodlands an unusually beautiful appearance, it was not without serious disadvantage: for, in some instances, the injury done to forest trees, such as old Scots fir, plane, beech, maple, oak, and birch, from the heavy weight of superincumbent snow on those of branching or flat heads, has been considerable. Mr Mackenzie, the intelligent and observant land-steward at Murthly, in Perthshire, reports regarding this branch of our subject, that in his quarter "one wood on the estate, of several hundred acres in extent, is almost a total wreck; it is principally composed of Scots fir, oak, birch, and larch, and a few spruces. Both the latter have escaped. The crop is between fifty and sixty years old, an age when Scots firs at high altitudes have generally broad tops.

Except larch and Norway spruce, few trees have escaped entirely without less or more damage, if growing at an altitude of over 500 or 700 feet." Mr Mackenzie also reports that many varieties of *Cupressus*, in closely-planted sites, are destroyed. In his district the loss from the intensity of the frost and exposure has been very small; *Cupressus Lambertiana* and *Wellingtonia gigantea* show signs of having been injured, the former severely, if not in some sites killed, the latter much scorched and disfigured. We have observed similar instances where trees and shrubs during last winter have suffered far less from the severity and number of degrees of frost, (even where the temperature fell to extremely low points), than from the breaking of limbs under the weight of snow, or exposure in low sites to bright sun rays after a sharp night of damp hoar-frost, as we shall have presently to refer to. Another indirect effect of the severity of last winter on young trees and evergreen shrubs was the ravages they sustained from rabbits and ground vermin gnawing the bark off their stems, many species being attacked and eagerly devoured, which generally in ordinary seasons enjoy immunity from such pests. Last year we are informed, on the authority of Mr Mackenzie of Murthly, that even the Scots fir, and, more wonderful still, the *Araucaria imbricata*, suffered in this manner. In some localities to so great straits were rabbits and mice reduced to obtain food, that they barked the hawthorn hedges where the surface was not too rough; and hollies and laburnums suffered much also. Towards the end of the month snow again fell, and there was a considerable increase in the severity of the frost, in several places the thermometer registering as many as 27° of frost.

The weather in March alternated between frost, snow, and thaw, and this month proved more disastrous to evergreens, trees, and shrubs than any other period of the season. The bright sun during the day, and foggy, damp, and excessively cold nights, caused irreparable injury on low-lying situations with an open exposure to the south. This was aggravated in the case of the victims growing in heavy clay loam, on damp subsoil, or near river sides. For example, at Craigiehall, near Edinburgh, and through the policies of which the river Almond flows, considerable destruction was caused to *Araucaria imbricata*, *Cedrus Deodara*, *Aucuba japonica*, common bay and Portugal laurels, many of which were killed down to the ground. The loss here includes thirty-six fine specimens of *Cedrus Deodara*, 20 feet high. The soil is rich, on clay subsoil, and altitude about 80 feet above sea-level. At the adjoining estate to the westward, also lying close to the Almond, but in a more open situation very much exposed to the sun's rays and heavy mists arising from the river, at Carlowrie, at an altitude of 92 feet, very serious injury has

been sustained by many of the fine specimens of choice new conifers and other evergreen shrubs. There the coldest nights experienced were the 25th December and 14th March, on both of which occasions the thermometer was observed to indicate zero; and on the 15th March the bright sunshine caused most of the havoc. Hollies in open sites stood well, but two plants very much sheltered by surrounding shrubs and much exposed to the sun, were killed to the ground. Walnut trees of 15 feet to 20 feet in height have had their previous year's growth killed; and some laburnums have suffered severely. In this situation and district, the winter of 1878–79 cannot be compared to that of 1860–61 in severity, for more damage was done in the last-named season; but more injury has been done in 1878–79 than by the severe winter of 1874–75. The wet summer of 1879 will compare with that of 1872; and it is to be feared that, from want of sunshine and continued rain, the growths of the injured but surviving victims of last winter, being badly ripened, will probably succumb, and, should the approaching winter be a severe one, these plants will fall to be added to the list of fatal cases.* The following is a list of the casualties last winter and spring in this situation and district, as observed in September last, after the summer's growth had fully divulged the extent of the effects of the severe season :—

Wellingtonia gigantea (30 feet high)—Very much browned, but now breaking afresh.
Wellingtonia gigantea variegata (6 feet) —Looking very sickly.
Cedrus Deodara (12 to 18 feet)—All but killed; some killed outright.
Picea Nordmanniana (8 feet)—Slightly browned in centre.
Cryptomeria Goveniana (9 feet)—Killed.
Thuja aurea (3 feet)—Dead.
Cryptomeria elegans (4 feet)—Lost its top shoot.
Libocedrus Chinensis nana (1 foot)—Dead.
Cedrus Deodara viridis (6 feet)—Much injured; since dead.
Taxodium sempervirens (30 feet)—Lost its top, and branches of young wood cut back several inches, but again breaking afresh at neck of branches next main stem.
Picea Albertiana (12 feet)—Looking sickly; lost its top.
Cedrus Libani (6 feet)—Dead.
Many spruces very much browned, and shedding their leaves.
Cupressus Lambertiana (8 feet)—Killed.
Pinus pinsapo (6 feet)—Lost its leader, and young wood of last year killed.
Juniperus recurva (6 feet)—Dead.
Taxus japonica (3 feet)—Dead.

The *Cupressus Lawsoniana* were here very slightly singed, and have thrown it off. *Aucuba Japonica* is very sickly looking, the foliage being perfectly shrivelled up, but it is sprouting again at the base of the stem. Numbers of the common bay and Portugal

* This has unfortunately been the case. The winter of 1879-80 has entirely killed many of the specimens referred to.—R. H.

laurels are killed down to the ground, but are now starting afresh from the stools. The *Rhododendron ponticum* stood fairly well in this district, but in the neighbourhood of Perth, near the banks of the Tay, we are informed that this usually very hardy evergreen suffered in its foliage and flower-buds rather severely last winter. In other situations, in the neighbourhood of Perth, facing the south and south-west, the effects of the severity of the season have been equally apparent. At Seggieden, in particular, and places similarly situated, over-hanging rivers and at low altitudes, considerable damage to trees and shrubs has been experienced. Common whin and broom, in exposed places in that district, suffered severely, and were, in some cases, completely killed. The unripened shoots of dogwood (*Rhamnus frangula*) were killed. It is curious to note that at Seggieden, Colonel Drummond Hay reports that, out of several bushes of *Ulex hibernica* growing there, all should have been entirely killed, with the exception of one plant, which, from some unexplained cause, remained perfectly uninjured, although growing within a few yards' distance from the others, and under exactly the same conditions as to age, soil, moisture, and exposure. Here, also, *Buxus balearica* has been utterly killed; *Cercis siliquastrum* had its terminal buds killed; *Cistus salvifolius* was killed to the roots, even although protected by snow, but has again sprouted; and the same may be said of *Erica Mediterranea*, *Laurus nobilis*, and *Viburnum Tinus*. Many other species of shrubs which were slightly injured and retarded in this district, such as white lilacs, are reported to have suffered more from the effects of the cold wet summer coming immediately after so long and severe a winter, producing blight; and conspicuous in this respect is the common Lombardy poplar, which has made little or no growth this season, and in some places, in the districts of the Tay and Earn, has been utterly killed by last winter's severity. The effects upon plant life last winter were experienced severely in Forfarshire, and there even the *Rhododendron ponticum* was included in the list of its ravages! *Arbutus Unedo* and *Euonymus latifolia* both suffered much in many places over the country, and where exposed to the sun, the latter shed its leaves. In several places around Kilmarnock this was observed, and at Henderson Manse, in Kilmarnock, *Passiflora cærulea* on a wall, and 12 feet in height, and proportionately wide across its branches, was killed to the ground, being fully exposed to the south. In several other parts of Ayrshire, *Camellia reticulata* and *C. japonica*, which had previously proved quite hardy, were, last winter, quite destroyed in their buds, and a *Desfontainea spinosa*, which had stood for fourteen years in the open air uninjured in this usually mild district, was a good deal blighted, although precautions were taken to protect its stem last year. In other situations, along the west

coast of Scotland, fuschias accustomed to withstand with impunity the winter in their various soils, were last year cut down to the ground, and in wet and heavy soils were killed outright. Ivies were very much browned, and, where exposed to the sun, had their young shoots killed. In this respect, the Algerian variety seems to have suffered most, and several plants of it are reported to have been completely killed. Conflicting accounts of the hardihood of one species and its unscathed condition in one locality, as compared with the partial or total destruction of the same species in another, are frequently to be found. These, however, can easily be explained on an examination of the nature and altitude of the sites where the plants are growing, and it may be safely asserted that generally, and indeed universally, in low lying situations, at the foot of hills, or in valleys, and in places near rivers, or hemmed in by trees, and where the spring sun's rays had full scope to act on the frost-bound trees, the greatest injury has been sustained in all parts of Scotland, while at higher altitudes, and on sites having less exposure to the sun, and on lighter soils, the injury has been frequently insignificant. That the intensity of the cold has caused less harm than the frosty winds and hoar-mists, followed by bright sunshine, has been clearly demonstrated, and further corroboration is afforded by the fact that in such localities indigenous and introduced trees and shrubs and other plants have suffered in like degree. Another remarkable feature of this severe storm and season, was the rending of the bark and stems of many varieties of trees in several places. One very notable instance is mentioned by Dr Landsborough of Kilmarnock. "In December 1878," he says, "when at Annanhill, Ayrshire, the thermometer had fallen to 11° on the grass, a fine young elm tree, 5 feet 2 inches in girth, in a site where it appears to feast upon the liquid offal discharged from a butcher's shambles, burst its bark, going off like a gun. The report startled the persons dwelling in the houses on both sides of the tree, bringing them to their doors. The bark was split upward to the length of over 8 feet, on the south side of the tree. With the return of spring the rent has closed, although it had been as wide in some places as half an inch!" Similar instances of tree-rending are reported from various districts, and have been observed on elm, ash, beech, oak, and Spanish chestnut of various sizes and ages. They occur chiefly on the side of the tree exposed to the south, and may be probably accounted for by the reserve sap and watery fluids in the tree getting quite frozen, the timber being caused thereby to swell from the action of the frost on these fluids, until the lateral fibres of the stem are parted asunder from the inward expansion and consequent pressure on the bark of the tree.

There is a considerable diversity in the reports of the effects

of the severe winter on vegetation generally, due, probably, in part to the varied depths of snow-fall on the smaller subjects, coupled with the unvarying persistency of the frost, and the varied exposure to sun-heat. In several situations, plants, which arborists would have expected to escape uninjured, have been cut down to the ground or killed altogether; while others, which are generally classed as half-hardy in the climate of Britain, and of Scotland more particularly, have singularly enough survived. For instance, peach trees in Scotland seldom ripen their young wood in any ordinary season sufficiently to enable them to withstand 20° of frost with impunity, yet, during the winter and spring of 1878–79, there is not one instance of the young wood being affected, although the temperature was even lower in some places. In Argyleshire, and other western counties of Scotland, much of the immunity which trees and shrubs enjoyed from the effects of last winter is attributed to the comparatively scanty rainfall of the previous summer, and the clear dry sunshine of the autumn months, having ripened the wood and young buds. No doubt, in such districts the influence of the sea in mitigating the rigours of the frost played a considerable part in contributing to the escape of vegetation in such places from the injurious effects produced elsewhere or in less favoured localities. In the island of Arran this was conspicuously apparent; for there three species of the New Zealand Blue Gum have withstood the frost. A large number of Australian and New Zealand tree ferns have also escaped. In Arran, the cold was much more intense during December than in January last, but these species were observed to suffer less in their foliage during the former than in the latter month; while other shrubs, which seemed unaffected by the frost, have, since the spring sunshine intervened, evinced symptoms of injury to their foliage and terminal points. The famous pine trees at Castle Kennedy appear to have been especially favoured, and very few casualties are reported; chiefly owing, probably, to the well-ripened shoots of the previous year; and much less injury has been done in Wigtonshire generally than in the winter of 1860–61, except in low lying damp situations, with a south or south-eastern aspect. Another notable result of the effect of this severe season is the injury done to variegated plants. This is peculiarly the case with the *Wellingtonia gigantea variegata*, whose beautiful pale yellow splashings have formed a singular attraction for the frost. Also, all variegated hollies, ivies, &c., have suffered where the situations are low and damp, and much more severely than the *self* or *un*variegated varieties. At Taymouth Castle a number of very handsome golden hollies have been completely killed. There also *Araucarias* have been much browned, and the plantations in spring were littered with the previous year's growth of

the common spruce. At Glamis Castle, in low damp situations, *Thujas*, *Abies Albertiana*, and *Araucarias*, have all suffered, while these survived uninjured at higher elevations. The lowest temperature there was on 11th December, when the thermometer registered 28° of frost; on the 14th of the same month there were 30°; and on 12th, 17th, and 24th January last, it indicated 4°, 5°, and 6° respectively. At Dunrobin, in Sutherlandshire, last year, the lowest register only indicated 13½° of frost, and little injury was sustained. In the winter of 1860–61 also, the comparatively milder climate of the district bordering on Golspie Bay was well illustrated in a similar manner; while at a distance of about 12 miles inland, 12° more cold was experienced last winter, and some injury done to plants of acacia and myrtle, fuschias, and pampas grass.

Reference has been made in this paper to the persistent continuance of the frost last winter as one of the salient features of this remarkably severe season. April, also, was a cold and variable month, with snow and frost; and the weather in May was not much better than that of April. Frost and snow were quite frequent, and bright and sunny days were accompanied by cold winds and sharp frost at night, greatly retarding the foliation of forest trees, which was observed to be fully a fortnight later on trees of every description, than is usually the case in an ordinary year. A proof of the lateness of the spring and intensity of the weather in May, is afforded by the fact that in the beginning of that month a fox, which, according to an old adage, "will not trust the ice after Candlemas," was observed walking across Loch Callater, in Braemar!

The records of such a winter and spring as those of 1878–79 tend to disprove the theory advanced by some, and first suggested by the late Mr M'Nab, of a climatal change having taken place in the winters of this country. Certainly last winter, when frost and snow prevailed, might well be called a "good old-fashioned" season,—"a seasonable Christmas," and so forth, but those who use such expressions, or quote the memories and accounts which have been handed down of bitter winters in past years, are apt to overlook the circumstance that such accounts nearly always tend to disprove, not to establish, the theory of change. Those records tell us of the exceeding severity of cold which prevailed at such and such a time, but they also tell us that the cold was altogether exceptional. Sometimes even we find that, while the *maximum* degree of cold recorded has fallen short of what had been often experienced within the previous twenty or thirty years, it is described as exceeding aught that even the oldest persons could recollect. Gilbert White mentions the cold in December 1784 as very extraordinary, but, he says, 1° below zero was the lowest temperature recorded in the shade. Now, in January 1855, 4° below

zero was recorded near London; and also in the memorable winter of 1860–61, as low a register as 8° below zero was not uncommon in many places in Scotland. Again, during last winter several stations report the thermometer as having indicated readings of zero, and of 1° to 3° lower.* From these early records of severe winters, we further learn that, as we have shown in this paper, to have been the case during last winter,—it was *the long continuance* of the frost of such years as January 1776, and others, *and not its intensity* which caused the effects to be so remarkable. This long continuance depended on the steady prevalence of northerly and easterly winds, and to this cause also we have shown that much of the damage of 1878–79 is to be ascribed. So severe has been that damage, as we have endeavoured to show, and so general and widespread the havoc to many parks and policy grounds of former beauty, that it is to be hoped there may be no repetition of such a season for many years to come.

ON THE RECLAMATION OF LAND FROM MOSS ON THE FARM OF UPPER BANDEATH, STIRLINGSHIRE.

By John Mackie, Upper Bandeath, Stirling.

[*Premium—The Medium Gold Medal.*]

The writer of this report is tenant and reclaimer of 10 acres of land from moss, which he cultivates along with the rest of the farm which is arable. These 10 acres form a square, which has an elevation of 45 feet above sea-level, and, being carse land, has no particular exposure. The soil is a good clayey loam, with bluish boulder-clay subsoil, belonging to the Pleostocene or Post-tertiary era. The average rainfall in the district for the last ten years has been 37 inches in the year. The great hindrance to its reclamation was a layer of moss which completely covered it to a depth of from 3½ to 4½ feet, thickly grown with heather,—the whole being of no value whatever; the moss not being of sufficient depth or density to make peat or fuel.

Processes Pursued in Reclamation.

It was resolved to profit by natural advantages, and run away 8 acres of the moss by water, and that the remaining 2 acres should be partly buried and partly burned—a very ancient and not uncommon practice,—but which I found the more uncertain. In the large moss, behind the 8 acres to be

* 3° below zero was recorded on two nights in the vicinity of Kelso.

run away was a large ditch which always contained running water, the water of which, having been dammed, was turned aside into a large marshy hollow, which was situated 40 yards south of the moss to be run away. Then, a simple wooden sluice was inserted into an old ditch which led from this temporary reservoir along the east side of the 8 acres to be run away, and from thence into the main ditch again, lower down, which in turn emptied itself into the River Forth, which ran 800 yards to the north of it. Then, the parties who had taken the contracts for the reclamation began to cut out large pieces of moss for 3 yards to the west of the ditch, which they flung into it, and the water having been turned on, the moss was carried away faster than they were able to cut it. By carefully husbanding the water the reservoir always contained sufficient for the purpose. When the aforesaid 3 yards had been cut and run away, a new conduit, 1 spading in depth, was always made close to the facing of moss again, until, in the spring of the following year, all the moss covering the 8 acres had disappeared. A thin scraping of moss was left on the soil, as moss has a beneficial effect when mixed with it. The cost of thus putting away the moss by water was £20 per acre.

It would be quite unnecessary to detail the usual mode which was pursued in burying and burning the remaining 2 acres. Suffice it that 3 spadings of moss were buried by trenching, and the fourth was built in small kilns; and after having been thoroughly dried was burned the following summer. In trenching the latter portion of ground, the men, under the superintendence of a drainer, placed 3-inch drain tiles every 16 feet at a depth of from $3\frac{1}{2}$ to $4\frac{1}{2}$ feet, thus effecting a saving in drainer's expenses. The cost of thus burying and burning the moss averaged £26 per acre.

It may be useful to know, in reference to the latter process, some facts regarding peat ash, which I shall state as briefly as possible. Many will doubtless remember the repeated attempts made to introduce peat-ash (Dutch), many years ago, into Britain, the use of which, though attended with excellent results in Holland, proved a failure here. The two principal causes for this were—the different nature of the soils operated on; and as was shown from the analysis of the widely differing ashes, the success attending its use in Holland was due less to those substances in it necessary for the food of plants, than to the mechanical action it produced in reducing the too tenacious nature of heavy soils (where its success was most marked) when largely mixed with it. In it, phosphoric acid, one of the most important nutritious constituents of plants, is generally conspicuous by its absence; while, again, sulphuret and protoxide of iron are frequent constituents, and they are, in fact, vegetable poisons.

Draining.

As I said before, 2 acres had been drained while burying the moss. The remaining 8 acres were drained in the summer of 1871 with 3-inch tiles, the drains being 16 feet apart, and from 3 to 4 feet deep, at a cost of £6, 9s. 0½d. per acre. My father, who was joint-tenant with me, personally supervised the operations of reclamation and draining. In September 1871, on the surface of the now cleared ground, 12 tons per acre of farmyard manure were spread, at a cost of £4, 7s. per acre. In the beginning of November the ground was ploughed, with a furrow of about 8 inches in depth and 9 or 10 inches in breadth. On the 12th of March 1872 5 tons of lime-shells were applied to the acre, and harrowed in at a cost of 60s. per acre. Four bushels of rye were then sown to the acre. It will be remembered that the summer and autumn of 1872 were very wet, so that the rye was not cut till the 3d of October. It was, however, safely secured, and, when thrashed about three weeks afterwards, turned out 32 bushels of grain per acre, which sold at 32s. per quarter; and 62 stones of straw to the quarter of grain, which sold at 8d. per stone. The field was ploughed again the same year. In the following spring it required comparatively little extra working for potatoes, of which 12½ cwts. of rocks per acre were planted in the first week of April. Ten tons of farmyard manure and 4 cwt. of dissolved bones and Peruvian guano were given per acre. The potatoes were lifted about the end of October, and yielded 6 tons per acre, which sold at £3 per ton. In the first week of April 1874 3 cwt. of dissolved bones per acre were given in order to benefit the grass crop to follow, and 5 bushels per acre of oats were sown; and, immediately after rolling, the following mixture of grass seeds per acre, intended for one year's hay and one year's pasture:

Rye Grass,	30 lbs.
Timothy,	10 lbs.
Red Clover,	5 lbs.
Alsyke,	2½ lbs.
White Clover,	2⅔ lbs.
	50 lbs.

The oats were cut on the 18th of August, and, on being thrashed a month afterwards, produced 5 quarters 2 bushels per acre, weighing 42 lbs. per bushel, which brought on an average 27s. per quarter; and 35 stones of straw to the quarter of grain, which sold at 6d. per stone. On the 11th of July 1875 the hay was cut and secured in good condition. The production was 1 ton 14 cwt. per acre, which sold at 105s. per ton. The second crop was valued at £2 per acre. In 1876 the field which was for pasture was not grazed on by the cows kept on

the farm, but by ten two-year old fattening cattle. This was done, bearing in mind that cows take more inorganic matter from the soil than fattening animals, on account of milk not being again delivered on and where it was produced. The realization from the cattle was £3, 5s. per head profit. The field was ploughed on the first week of November that year. On the 5th of April following it was sown with 4½ bushels of oats per acre. The oats were cut on the 19th of September. This was a very wet season; but, by seizing every favourable opportunity, the grain was secured none the worse, considering the heavy quantity of the straw. It was thrashed on the 23d of September, and produced 5 quarters 5 bushels of grain per acre, weighing 41 lbs. per bushel, which brought 26s. per quarter; and 40 stones of straw to the quarter of grain, which sold at 6d. per stone. On 26th April 1878 the field got 12 tons per acre of farmyard manure, and a mixture of Peruvian guano, treated with sulphuric acid and magnesia and dissolved bones, to the extent of 4 cwt. per acre. Five acres were planted with 12½ cwt. of rock potatoes per acre, and the other 5 acres were sown with 4 lbs. of yellow turnip seed to the acre. We began to lift the potatoes on the 18th of October; the yield was 5 tons per acre, valued at £3, 4s. per ton. The turnips were a very indifferent crop, and were valued at £6, 10s. per acre. This year the field contains a very good crop of oats. It shall now be wrought on the regular rotation of the farm.

I here give a full and comprehensive summary of the expenditure and returns, so that one may arrive at the nett profit, after allowing for interest on money sunk, as nearly as possible. With the exception of the year 1872 I place the expense of each crop's ploughing in the same year as the crop is grown, though the ploughing was always done in the latter part of the past year:—

EXPENDITURE.

Year.	Crop.	Reclaiming.	Draining.	Ploughing, Harrowing, Rolling, Grubbing, and Drill Harrowing.	Seeds and Rye Grass, &c., including Sowing.	Manures.			Reaping, Harvesting, Thrashing, Thinning Turnips, Lifting Potatoes, and Miscellaneous.	Total.
						Dung	Lime.	Guano.		
		£	£ s. d.	£ s. d.	£ s. d.	£ s.	£ s.	£ s.	£ s. d.	£ s. d.
1870	...	...	...	...	...	...	...	...	...	...
1871	...	212	39 17 1	7 10 0	...	43 10	...	...	10 13 8	333 10 9
1872	Rye, .	...	...	2 10 0	8 5 0	...	30 0	...	9 16 2	50 11 2
1873	Potatoes,	..	...	15 0 0	23 2 6	36 0	...	19 0	9 3 0	102 5 6
1874	Oats, .	...	...	10 0 0	10 12 3	...	...	13 7	10 2 2	44 1 5
1875	Hay, .	...	...	0 7 6	5 15 0	...	...	...	4 0 6	10 3 0
1876	Pasture,	...	...	...	...	...	...	...	0 3 6	0 3 6
1877	Oats, .	...	...	10 0 0	8 4 9	...	...	...	9 10 2	27 14 11
1878	Potatoes and Turnips,	...		15 18 0	14 17 5	40 0	...	24 12	14 3 0	109 10 5
										678 0 8

INCOME.

Year.	Crop.	Value of Grain.			Value of Straw, Hay, and Pasture.			Value of Potatoes, and Potatoes and Turnips.			Total.		
		£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
1870 and 1871	...		...			...			...			...	
1872	Rye, . . .	64	0	0	82	13	4		...		146	13	4
1873	Potatoes, . .		...			...		180	0	0	180	0	0
1874	Corn, . . .	69	3	9	45	18	9		...		115	2	6
1875	Hay, . . .		...		109	5	0		...		109	5	0
1876	Pasture, . .		...		32	10	0		...		32	10	0
1877	Corn, . . .	74	10	7½	56	5	0		...		130	15	7½
1878	Potatoes and Turnips, .		...			...		112	10	0	112	10	0
											826	16	5½

The above tables show a profit of £148, 15s. 9½d. But allowing interest on capital sunk in improvements at the rate of 6 per cent. per annum, there is a total of £118, 16s. 10d. for interest, which, deducted from the above profit, leaves a balance of £29, 18s. 11½d. against the improvements.

ON PLANTATIONS ON THE ESTATE OF GLENGLOY, INVERNESS-SHIRE.

By George Grant Mackay of Glengloy, Kingussie.

[*Premium—The Gold Medal.*]

The estate of Glengloy is situated in the Lochaber district of Inverness-shire, on Loch Lochy, in the line of the Caledonian Canal. The lake is 90 feet above the level of the sea; the highest point on the estate is 2103 feet. The ground is very steep, and covered with excellent green pasture. The soil is a good loam, resting on open porous gravel, and is thought specially adapted for growing larch.

The estate was purchased in 1875. The total area is 5464 acres, of which 1295 acres have been planted during the last three years. The lands being entirely in the proprietor's occupancy as a sheep farm, he was able to plant wherever he thought proper. While, therefore, large areas have been planted at both extremities of the property, eleven smaller plantations have been formed, with a view partly to providing shelter for sheep. By thus forming a number of smaller plantations, instead of one large one, the cost of enclosure is much increased, and further, from breaking up the continuity of the sheep walk, the immediate value of the adjoining grazing lands is reduced, still, ultimately it will be of great importance to the estate for grazing purposes, apart altogether from the value of the timber.

The various plantations, fourteen in number, are as follows:—

Stronagloy,	560 acres.	Planted, 1876–1877
Tarsuineas,	450 „	„ Spring, 1877
Fallbelt,	6 „	„ Autumn, 1877
Ault-na-gamhnaich,	50 „	„ „ 1877
Ault-na-leitre,	13 „	„ „ 1877
Coachan-fearna,	6 „	„ „ 1877

All these are along Loch Lochy, with a northern exposure, at an average height of about 500 feet.

Two mile belt,	16 acres.	Planted, Spring 1878.
Bulloch,	24 „	„ „
Old Fank,	36 „	„ „
Gloy Falls,	55 „	„ „
Ault-na-reith,	10 „	„ „
Ault-Goibhre,	13 „	„ „
Coire-Ghrianach,	56 „	„ Spring 1879.
Total,	1295 acres.	

These latter plantations are in Glengloy, with a southern exposure, at an average height of 800 feet.

All the work was done by the slit method of planting by the common spade, and 4 feet apart was the distance roughly aimed at. The planting was commenced in autumn 1876, and completed in spring 1879.

The total numbers and ages of plants were as follows:—

	Number.	Age.
Larch,	1,765,000	1-year seedling (1 and 2 years transplanted).
Scots fir,	1,040,000	2-year seedling (1 year transplanted).
Spruce,	350,000	2-year seedling (2 years transplanted).
Poplar (Black Italian),	20,000	About 4 feet high.
Hardwood (varieties),	43,650	About 2 feet high.
Total,	3,218,650	

Being 2485 plants on an average to an acre.

The total cost was as follows:—

Plants,	£1847	1	9
Freight and Cartage,	127	4	5
Planters' Wages,	960	7	6
Draining, *Nil.*			
Bridle Paths, about 5 miles,	128	6	8
Foresters' Wages for three years (proportion),	120	0	0
Cost of Wooden Barracks for Labourers, Furnishings, Spades, &c.,	170	13	10
Cutting Brushwood,	25	0	4
Fencing 20 miles 922 yards,	1270	13	8
Total,	£4649	8	2

or £3, 11s. per acre, including about £1 per acre for enclosure.

All the plantations have been enclosed with wire fencing—mostly having six wires (of No. 6 best bright wire) with larch posts and iron angular droppers between. In some cases a larch post and iron dropper were placed alternately; in others, two iron droppers were placed between every larch post. The straining posts are of iron.

The best and cheapest fence is thought to be that with iron strainers—with larch posts at every 6 yards, and two angular iron droppers between—thus leaving 6 feet between each post or dropper. The cost (at present prices of iron and labour) is 8d. per yard, which is only half the cost of a fence of iron alone, and really less costly to keep in repair, although that is not the common opinion; about 2 miles have been erected entirely of iron, having standards at every 30 feet, and four droppers between, with steel wire—all galvanised. This is a neat fence, and suitable in some situations, but nearly double the cost of that already mentioned. The cost was 1s. 2d. per yard. No draining was required, as the whole land is perfectly dry.

All these plantations are growing well and rapidly. Some of those planted three years since are already visible from Loch Lochy, half a mile distant. The Scots fir has suffered from black game. It seems strange that in none of the works on forestry that have been published has any reference been made to the injury done to young Scots fir by black game picking out the buds. Every effort will be made for a few years to destroy black game, until the plants have grown sufficiently to be out of their reach. Wherever young plantations are laid down, rabbits, hares, and black game should, as nearly as possible, be exterminated.

The reporter is persuaded that from every point of view there is no kind of improvement on an estate at all to be compared with planting. It is at the same time the most beautifying, most beneficial, and most profitable.

It is constantly affirmed, by experienced foresters and planters, that all land worth not more than 10s. per acre of rent, should be planted, as being the best investment for money. If this is so, how much more profitable must it be to plant land that is not worth more than 1s. per acre for grazing, of which there are hundreds of thousands of acres throughout the Highlands, admirably suited for the growth of timber. Very frequently land not worth 1s. per acre for grazing, is more suitable for planting than land worth 10s.

It is admitted by everybody conversant with the subject, that land under plantations yields not less than £1 sterling of rent from the date of planting onwards for sixty years. In the case of the plantations now reported upon, the lands yielded 2s. 8½d. per acre average for grazing, and if they now yield 20s., besides

the interest of the money expended, the actual return from the land is increased more than sevenfold. This result will be obtained on Glengloy, besides converting it from a bleak, exposed, uninteresting subject into a clothed and sheltered one.

The reporter is so convinced of the profitableness of planting, compared, or rather contrasted, with every other species of land improvement, that, apart from the subject of this report, he has planted upwards of twelve millions of trees of all sorts within the last twelve years. One of these plantations, on the estate of Strathkyle, in Easter Ross, contains about eight and a half millions of plants, and extends in one block to 3950 acres, being enclosed with a ring fence of wire upwards of 20 miles in length.

If the subject of planting were properly understood, a large proportion of the Highlands should be planted with Scots fir and larch, and abundant employment found for many times the present population, and all wild schemes for cultivating our waste lands might then be laid aside.

In a comparison between the profitableness of planting or reclaiming land for cultivation, the advantage is enormously in favour of planting. The planter, instead of at great expense trenching the land and removing stones and roots, slits in little plants of a foot in height, and leaves them there quietly to take up the valuable ingredients of the subsoil by their roots, and deposit them year by year in leaf on the surface; thereby effectually trenching the soil without any cost whatsoever, besides reaping a highly remunerative crop of timber.

With the limited extent of land in the British Isles, and a superabundance of labour, it is sad to see the vast extent of land still lying waste and unprofitable, simply from want of thought. As to the cost, there seems to be abundance of money to invest in the improvement of every savage country on the face of the earth, but none to develop our own extensive wastes at home.

ON THE DIFFERENT METHODS OF MAKING AND CURING BUTTER IN THIS COUNTRY AND ABROAD.

By John M'Culloch, Denbie Mains, Lockerbie.

[*Premium—Ten Sovereigns.*]

Butter has from time immemorial formed a portion of and held a high place in the dietary of civilised nations. Among the cultivated and refined of modern times, it is considered a crowning luxury for at least one, sometimes two or more meals; where it is absent the table is incomplete and a void left which no other article can adequately fill. But it is butter perfect, or

very nearly approaching to this point, which takes such a strong hold on the appetite; that which is imperfect in consistency and flavour is as much despised as its opposite is prized. The "firsts" of the Irish, the "gilt-edged" of the Americans, the Danish "estates," and the best Swedish, Dutch, French, and home butters have such a relatively high market value compared with the other extreme in the scale, that no further evidence is required of the difference existing in the minds of consumers between really good and really bad butter. And as almost every family either makes or buys butter, it might be presumed that the production of an article of such general use would be understood to perfection, and that nothing but that at least approaching a first-class character would leave the place of manufacture. Nevertheless, perfection is much more an exception than the rule; and the reason is not so much the want of care as the intricacies inherent in and surrounding the art of butter making. Success in it depends on a variety of circumstances—any one of which being unfavourable—and on a succession of little acts and processes—any one of which being imperfectly performed—may, and almost certainly will, alter the character of the butter. And, without a more perfect scientific knowledge of the properties of milk—the changes occurring in it and the causes which produce them—it is probable that some time may yet elapse before even the greatest care will produce uniformly good butter.

In referring briefly to some of the circumstances affecting the manufacture of butter, the influence of the breed of the cow is worthy of notice. The Channel islander has large milk globules of a pretty uniform size and with a very delicate covering, thus indicating easy churning and a strong and unbroken grain in the butter. Devons come next in this important particular, then the old Holderness; while the Ayrshire, Shorthorn, and Dutch cows have smaller and more unequal globules, and covered with a much tougher membranous material. It is readily seen that in the milk of the latter breeds, churning will be prolonged, and that some of the butter enveloped in the smaller globules will never be obtained at all. In an experiment made by Dr Sturtevant with the milk of two Jersey and two Ayrshire cows, the globules of the former averaged in the one cow's milk $\frac{1}{5680}$, in the other $\frac{1}{5940}$ of an inch; those of the latter $\frac{1}{4666}$ and $\frac{1}{6000}$, showing that there was not a great difference in the size either in the milk of cows of the different breeds or in different animals of either breed. The cream from the Ayrshires took 20 and 25 minutes respectively to churn, that of the Jerseys only 3 and 8 minutes; thus proving that the pellicle of the butter globule of the latter was in churning much easier broken. The Ayrshires from new milk only gave part of the butter at 15

minutes and the rest at the end of 10 minutes longer; thus showing the inequality as to size and the toughness of the membrane; while the Jerseys, from milk everyway the same, gave butter in 5, and churning ceased at 8 minutes.

The health of the cow, also seriously affects the milk and consequently the butter. When a feverish condition—often unnoticed—is in the cow produced by fast-driving, annoyance, or worry, or even by exposure to a hot sun, and also by her being stinted of food or water, or, if though plentiful, they are of bad quality; the constituents of the milk, as found by analysis, are much altered. In milk rendered abnormal through being subjected to the influences referred to, the casein and albuminoids are almost doubled, the butter reduced by a half, and the sugar to rather less than a third of what they would have been with the cow in a normal state.

Butter Fats.

The fats of which butter is composed are four in number: the hardest is stearine—a white, flaky fat; the next in consistency is palmatine, resembling palm oil, and giving most of the colouring matter; the third, oleine—thin and oily; and the fourth consists of essential oils, probably as numerous as the varieties of food. All are derived from the food of the cow; but how much is directly derived from it, and how much elaborated out of the other elements of the food, is not well ascertained. No doubt, their characteristics change with the constitutional peculiarities of the cow and the condition and quality of her food; and, in the same animal, they change with the various degrees of age and succulence of the food and the abundance of the fats in it. Young food gives a higher colour and aroma than that approaching maturity; but permanent pastures and those of older rotation have these properties in inverse ratio to the age. The specific gravity of these fats in combination is 983 to 1000 for water; when separate no standard has for any of them been fixed. The essential oils are, of course, lighter than the solid fats, and these vary much—stearine, palmatine, and oleine being heavier in this order, although it has been known to be reversed. Besides the fats and oils enclosed in the globules, milk contains other volatile oils loosely mingled with it, and not in combination with any constituent, so much so, that they escape immediately on exposure to the air or the raising of the temperature.

Animal Odour.

Animal odour is a flavour intrinsically belonging, to some extent, to the milk itself, for it is present in greater proportion

when the milk is newly drawn. If not dissipated by exposure to the air, it affects not only the milk but all the products manufactured from it. It is best known as the peculiar flavour of new milk, which prevents, with some individuals, its use at an early stage. In some adults it produces nausea and disturbs health; but it is relished by, and is altogether innocuous to, children. This odour is peculiar to the milk of all mammalia, and has a powerful influence on it, so much so, that there is a very great difference between that in which it exists and that from which it is expelled. It resembles the mingled breath and perspiration of the cow, is in a greater degree attached to milk newly drawn, and is spoken of as a "cowy" odour. It is to the factory managers of America we are greatly indebted for a better knowledge and management of this enemy, for previous to their origin, even yet in this country, it has not attracted sufficient attention. But the increased supply of milk now required for the large towns, and the urgent demand for a better article in milk, cheese, and butter, have in late years led to a better idea of its nature and the means to be employed for its dissipation. The influence of animal odour on butter is, without doubt, deleterious; for if it be, by cooling the new milk too low or too suddenly, carried into the cream and thence into the butter, a bad flavour is the result. The fine, aromatic, delicious taste of the oleine and its essential oils is replaced by a strong indistinct flavour betraying the presence of some impurity, and the former—the one natural to the butter—becomes so modified and obscured as to be indistinguishable; consequently, such butter is said to be "off flavour." This odour escapes rapidly with an increase, slowly with a decrease of temperature; when very low it fails to escape and remains permanently in the milk. If milk is kept warm it forms as readily after it leaves the udder as in it, and ordinary milk will as much—nay, more than new milk—produce it if it is kept covered and warm; but if milk is altogether boiled it cannot form. It is considered to be the result of germs which are produced at any time, but in greater and multiplying numbers when the cow is not in her ordinary state of health. It behaves as a ferment, multiplying with great rapidity under favourable circumstances. Keeping the milk in too large masses without stirring it, or having any disagreeable odour within reach, will produce the ever multiplying spores; consequently, cleanliness and care in regard to this susceptible ferment are indispensable.

Exposure to the Air.—Organic Germs.

Apart from animal odour, milk is of itself an unstable compound. It is continually undergoing change from its secretion

till it is either manufactured or consumed. In the udder, busy absorbents which line the milk tubes carry into the general circulation part of the nutrient properties it contains; thus it loses a portion of fat, albuminoids, sugar, and water, and possibly, too, of its salts. But if drawn into a bottle or other vessel without exposure to the air, and so kept, it will not spoil for an almost indefinite length of time. Otherwise it attracts from the air the seeds of a fungus plant which grow, multiply, and produce souring—the *arthrococcus* cells of the savan. The boiling-point temperature will certainly kill them, but it is not considered that either cold or wet will, although the former will, when intense, at least hinder reproduction. One or two left on a milk vessel, or in one of its crevices, will, on being moistened with warm milk, again spring into active life, quickly produce millions, and premature souring results. There are also destructive agents which get into milk through the cow's body. These are the *micrococcus* cells of the learned, very minute and everywhere abundant. Within the snow lines of high mountains, as proved by the experiments of Tyndall on the Alps, they cannot, in otherwise favourable circumstances, spring into life; and, according to other experiments, when once formed no amount of cold will kill them. The heating to the boiling-point certainly disposes of them; it is for this that green fruit is scalded, and with the desired effect. Milk is extremely susceptible of any ferment, it readily adopts its seeds, and even the flavour of a tobacco pipe will be imparted to it in a close compartment. Diseases have through its means been transmitted, and the peculiar smell of a cellar is readily detected in the milk which has been set in it. A good butter-maker will object to cooling warm milk in the same room where other milk is set for the cream to rise—the odour leaving the former being readily adopted by the other.

Souring.

When souring once begins it continues until the sugar is converted into acid. The whey begins to separate from the thickened milk, the vinous fermentation sets in, alcohol is slowly formed and takes up the volatile oils, the strong acid ferment acts upon the solid fats, and both quantity and quality of product are injuriously affected. Still longer will convert the alcohol into vinegar with even worse results. But there is a time in the souring process when the butter separates more perfectly from the other constituents. Acidity is well known to exert a powerful and beneficial action in the manufacture of cheese, and, although different in butter-making, it can also be turned to account. The acid as it develops thins and wears away the membrane which covers the butter globule, and at the

stage when this is done, without the further action which has been shown to be deleterious, is the time to separate the butter. Further souring, besides making less quantity of butter, would, by breaking the grain of the butter, make it also more greasy.

Cream.

Butter is the whole available fat of the portion of the milk known as cream. Pure cream consists only of the fatty globules whose composition has been explained, and on the breaking or removing of the pellicle which envelops them, the fat is collected and butter formed. Even some naked fats moving about in minute particles in the milk, and originally derived from the essential oils of the food, may enter into the composition of butter. In extreme cases water may be present in the globules to the perfect exclusion of fat. Cream has a specific gravity of 983 to 1000 for water, corresponding with that given for the fats in combination, of which it is composed. Berzelius gives it at 1024, but when it is observed that this cream gave only 4½ per cent. of butter, and the residue 3½ per cent. of casein and 92 per cent. of water, it is quite evident that there had been a large proportion of milk in the cream. In value and in specific gravity cream nevertheless differs much. A milk giving 25 per cent. of cream, and analysed by Professor Arnold, gave the very disappointing result of 4 per cent. of fat, and 13 per cent. of dry solids. By and by the cream of the same cow's milk dwindled down to 12 per cent., the analysis showing only a slight falling off in solids, while the fat actually increased. Thus it is seen that quantity of cream is not an absolute test of butter product, —opacity must be considered as well as bulk.

Milk Vessels and the Raising of Cream.

Various kinds, and of every conceivable form, are the vessels used for setting milk to the production of cream. The one in general use in this country is the common tin plate of 4 or 5 inches deep,—now much improved by being galvanised, or tinned, and without seam. These cool the milk readily without the use of cold water or ice, are light and handy, adapt themselves to almost any unoccupied space, and when empty store past inside each other into very small dimensions. They are, however, better suited to small dairies, in which butter in this country is principally made, the larger ones being mostly cheese-producing. In large dairies, and in the factories of America, either large rectangular vessels of a flat shape, and suitable for shallow setting, or deep and narrow cans for deep setting, are used. In the rectangular ones there is almost invariably, in America, a

channel between two pans inside each other, or between a false and true bottom, into which cold water or broken ice can be introduced. The deep cans are only suitable for such countries as Sweden or America, where a very low temperature can be reached by the application of ice, of which more anon.

The antiquity of the separation of cream from milk might indicate in this age something like proficiency in the art. Nevertheless the best method is far from being settled, and the various ones practised have each its advocate, firmly asserting the superiority of that particular mode. Opposite practices thus increase confusion to the beginner, and this state of matters will not be much altered until manipulators have a much better idea of milk constituents, and the laws and circumstances which affect them. A short explanation of some of the leading principles may tend to establish a clearer road through the labyrinth of theories, ideas, and written and unwritten practice. Cream rises on account of its specific gravity, being less than the surrounding milk, the difference, however, being so slight that a very sluggish upward movement is given to the globules,—so much so that some of the smaller and more dense never rise at all. Sometimes even, from a difference of composition and consequent opacity, large ones may not rise; but the best portion always rises first and is highest coloured. Colour, flavour, and quality lose, but keeping qualities improve, with each successive skimming. But undue skimming,—say after 48 hours at 60°,—will deteriorate the quality, so as to do more than compensate for the small increase of quantity thus gained.

Fats expand and contract more than water with alterations of temperature, and the greatest difference of the specific gravity of milk and cream exists when hot, the least when cold. And as fat—the principal constituent of cream—swells more with heat, and shrinks more with cold, than water,—the principal one of milk,—it is evident that in an unvarying temperature cream will rise more readily under the influence of a high one. The colder the milk the slower the rise; because there is less difference in the specific gravity of the milk and cream, and also because the milk, then more dense, will obstruct it. This is illustrated in the making of whey butter, when a temperature of 170° is resorted to; because the difference of the specific gravity, caused by the greater swelling of the cream than the water of the whey, raises the former in a very short time. At half the temperature—85°—the difference being less, four times as long is required to bring up all the cream that will rise.

It has been observed by Professor Arnold that fat expands twice as much as water with the same increase of temperature,—from 60° to 130°. But in the ten degrees between 40° and 50° water only expanded one-tenth of the ten between 80° and 90°; and

correspondingly, the same law affects shrinkage. In falling from high to low, water shrinks little, fat much, and the specific gravity thus becomes more nearly alike; hence the fat rises slowly at a low and unvarying temperature. From the fact of water being a better conductor, it feels the effect of heat or cold more readily than the fat in cream; thus, when the temperature is rising, the difference of specific gravity is diminished,—when falling, increased. At the same temperature the difference is so little as to give only a very slow motion to the cream; but any serious alteration of temperature, from the effect of either heat or cold, will give, in the case of the latter, a hurried ascent, in the former, a scarcely perceptible one. And as some particular fancy as to a particular heat or depth has become firmly fixed in the mind of the dairyman, this accelerated ascent of cream in a falling temperature has rarely in practice been turned to the best account.

As to depth, it is evident that cream will rise quickest through a small depth of milk; but still no particular depth can, without a due regard to volume and temperature, be set down as the correct one. For instance, two vessels of milk of even depth at 80° being set in a room at 50°, but with one of them previously cooled to the same temperature as the room, that one will not throw up the cream so rapidly or so perfectly, because it received no benefit from the difference of specific gravity arising from the falling temperature. But if it had been allowed to stand until the cream ceased to rise, and then rewarmed and set at 50°, or alternatively,—without being again warmed to the original temperature,—it had been set in a room 20° colder, so as to allow a farther fall of temperature, as good result would have been got as from the other vessel. Shallow setting will throw up best in a warm room; because in a cold one it goes through its fall of temperature so quickly that the cream has not time to rise, and, as before shown, a high temperature, when unvarying, tends to a quick rise. Milk spoils sooner when kept warm; yet milk two inches deep at 65° will throw the cream quickly and almost perfectly; but it would not do so at 50°, because the milk, falling quickly to the room temperature, loses the benefit of the difference of specific gravity before the cream is all up. At 65° it will rise through 2 inches perfectly before souring begins; but at 60° souring would begin before the cream was all up, and both quantity and quality would suffer. But if the deeper vessel were set at 50° the result would be different, the greater depth prolonging the cooling, so that the cream would be all up before the temperature of the room was reached. Thus it is easily seen that both deep and shallow setters may be right, if only the temperature through the range of which the milk has to fall in cooling be properly arranged. Larger or smaller

volume together affects the temperature in cooling, and consequently cannot be overlooked in the arrangement. In cooling to a very low temperature, the slower the better, and deep setting and large volume tend in this direction. Thus bulk and depth require to be graduated in accordance with the point to which it is considered the milk can be cooled; and it is evident that shallow setting and small volume will suit warm countries, deep setting and large volume those of a colder normal temperature, and with facilities for the procuring and keeping a supply of ice. With shallow setting in a high temperature the depth should be made so that souring does not begin before the cream is all up. Cold water, in cooling milk, brings the cream faster at first than cold air; but the latter, from its being a worse conductor, and consequently at a disadvantage in the first stages, cools it more slowly, and which, if not overdone, will give most cream.

The greater the number of degrees through which, under proper arrangement, milk falls in cooling, the more perfectly will the cream rise. With an unvarying temperature it is better high than low, and thus a mistake has arisen into which many have fallen,—the ascribing the perfect rising to a low temperature by itself, instead of a constantly falling one. High temperatures induce the growth of organic germs, and the formation of sour milk cells, which retard some and altogether hinder other globules from rising. Cooling stops the multiplication of these germs, and boiling altogether kills them. These hurt the flavour of the milk and butter, and thus cleanliness and a better knowledge of the conditions of milk, cream, and butter under different treatments and temperatures become the best means of their prevention.

Skimming and Preparing Cream for Churning.

If butter making alone is contemplated, skimming may be begun when the consistency of the cream is such that the track of the finger, on being drawn through it, is not immediately filled up; if skim milk cheese is to be made, then it should be done much earlier—before souring begins. In deep vessels at a low temperature the cream will, however, remain soft long after it is all up. Milk which is cooled below 50° for the cream to rise will keep a long time, and a little will rise as long as it is sweet; but 60 hours is considered the maximum time, anything longer doing more harm than good. When the cream is all up skimming proceeds, and it is better to skim away a portion of the milk along with the cream, both making 25 per cent. of the entire bulk. For this course there are two reasons. Too much butter to the bulk of cream causes too severe handling of the globules in the churn, and there is a little butter got from the milk nearest the cream. Some churn, quite unnecessarily, the

whole of the new milk; of course this is necessary when the whole bulk is *lappered* or soured. In deep setting the cream should be dipped off.

If cream were left long enough on the milk it would be entirely consumed by the germs and the fermentation induced by them, just as both animal and vegetable matter have been seen to fall a prey to this destructive agency. But in the incipient stages of this change there is a proper ripeness, or state of the cream, from which the best general result is obtained. A high temperature brings it more rapidly, and it is indicated by a moderate degree of acidity and pretty firm consistency in the coagulum. The acidity should alike pervade the whole bulk,—if some is sweet and some sour the latter will churn first and loss result; hence it is a good practice to mix the different messes,—stir them well and allow them to stand for 12 hours at 60°. If colder, it should stand longer; warmer, shorter. Even if only from one vessel it should stand until the whole is evenly ripened, for the top is relatively riper than the bottom. Cream spoils quicker than milk, and on this account should be kept cooler. But better mix with milk and churn than keep it long; and if for this purpose the temperature require to be changed, it should be done slowly, by placing the vessel in either cold or hot water as desired.

Lappering.

This is the term applied to a method of treating milk previous to its being manufactured into butter. It seems to be more common in Scotland and in Holland than any other country in Europe. It consists in setting milk in the ordinary way as for cream raising. Here the falling temperature is of no account. After it has been allowed to sit for 12 hours,—longer or shorter according to temperature,—it is then emptied into the lappering dish, generally, when made for the purpose, about 2 feet high by 1½ broad, and where, in summer, it soon begins to acidify. In winter it will not readily sour of itself, and consequently a little acid buttermilk is added to hasten the operation. It has been before mentioned the danger of allowing milk to become sour when cream is raised by the ordinary plan of setting. But the extent of acidity which produces the lapper is only on the road to the stage at which a greater degree will, by the production of alcohol, reduce the quantity and deteriorate the quality. Acidity, though a powerful agent for evil, is also, when skilfully used, a useful one to the cheese-maker, and little less so to the butter-maker. By a proper control of this agent unquestionably more butter will be produced than by any other method; some even say the quality is also improved, but to this the writer

demurs. The acid thins away the covering of the butter globules, large and small alike, while those which rise in cream are never altogether the whole of those present in the milk. It is easily seen, then, how the greater quantity is obtained, and as acidity is not incompatible with a fine flavour in cheese-making, it may in butter be in a similar position. About 36 hours in the lapper dish, at a temperature of 65°,—in which time it will be sufficiently coagulated in summer without, and in winter with, added acid,—the churning may then proceed. The temperature may run from 55° to 60° in summer, as high as 75° in exceptionally cold weather, and with cows long calved in winter; but each place, and the accompanying circumstances, dictate a proper degree with which a manipulator should soon become thoroughly conversant. Electricity, by causing premature souring, reduces both quantity and quality as in cheese-making,—a result less noticed in cream raising.

White Specks in Cream and Butter.

These may be produced in dry weather by dry clots of cream, but generally they are broken up and mixed with the buttermilk in the process of churning. A much more usual cause is the coagulation of small portions of milk by the action of organic germs within. This is much more likely when, as before indicated, these germs begin their work,—at a time when the milk, from the cow being dried for the season, remains long in the udder,—in the body of the cow. With the aid of the lactic yeast ferment, the germs obtained from the air and other sources curdle a little of the milk, the fermentation around forms a gas inside the fleck, and, being lighter than the milk, it ascends with the cream. Sometimes developed in the cream, it will coagulate a bit of milk and remain there, and when churned, the curd being tough, does not yield to pressure so as to burst. Scalding alone will cause them to disappear. They have been known to develop in one pan exposed to the light, while others away from it remained intact; and they have been known in the milk of one cow, while that of another similarly treated escaped. Butter will not suffer much from dried cream, but the origin of the others leaves no room for doubt as to their effect. Mixing and stirring the cream will prevent dried clots,—the germs once set in motion can not be destroyed without scalding. Butter with flecks, the produce of fermentation, will not be the best quality, and will neither keep long nor well.

Colouring.

When butter is very pale, its appearance and market value

are improved by a little colouring. The desired quantity of annatto—the best known material for the purpose—should be mixed with the cream before stirring and mixing, and in no case should colouring matter be added to the butter itself, as it cannot be perfectly incorporated with the butter, and will appear irregularly throughout. Colouring with carrots or other similar substance is objectionable, for the vegetable matter, soon decaying, lends decomposition to the butter with which it is mixed. Artificial colouring should only be sparingly used, as the natural hue is always the most perfect, and a very slight shade beyond will give an unnatural appearance.

Churning and Churns.

When butter can be worked so that the globules of fat of which it is composed remain unbroken on escaping from the enveloping membrane, it will, in a temperature of 60°, break like cast iron and show a granular structure. This is best seen under the microscope, and in trade is known as the grain of butter. Butter thus treated will keep better, and have a better taste and flavour, than if the granules had been broken,—in which case the butter becomes greasy, and will part like salve or green putty. In the latter state it will not keep well under any circumstances; in the former it will keep long and well under almost any disadvantages. And the keeping of the grain of butter whole is important, not only during, but after churning. Too cold churning will cause the grain to get broken by increased friction; too warm by the mixing of the softened fats. The object of proper churning is to break the pellicle without disturbing the granule within, and this is best done by combining pressure, rather than friction, with the required motion. Pressure acts on all the globules alike,—friction on those coming into direct contact. The old-fashioned upright dash churn fulfils well the desideratum. It should be slightly barrel-shaped, and the dasher either altogether round or with only two cross sections, which, taken together, come pretty near completing the circle. A rectangular box with a reciprocating motion, and dashing the cream against both ends alternately, a similarly shaped one rotating either from the centre of the sides or from the corners, and a barrel one revolving endwise, are good forms. The kind most in use is a fixed rectangular one, with a rotating dasher within,—on the principle of friction rather than pressure. The dashers within should have few notches, for these increase friction and tend to greasy butter.

The best temperature for churning, subject to modification, may be set down at 60°. Sour cream churns at a lower temperature than sweet, but if too sour more labour is required. Whole

milk requires 4° or 5° higher than cream of the same acidity. The smaller the size of the dasher in relation to the space in which it works the higher temperature will be required. To churn in the same time, sweet cream requires 4° or 5° of higher temperature than sour, except in the case of Jersey cows. Distance from calving requires a higher temperature, and even then, on account of the smaller globules, may protract churning. Scalding milk when sweet facilitates churning, and when faulty or bad to churn this may be resorted to. When the cream gets frothy, and is either too long in churning, or refuses to give butter at all, it proves either that the temperature is too low or that it is too long kept. Alum also has this effect, and meal, soap, and a great many other ingredients, will prevent butter coming. In autumn or winter the temperature requires to be higher than in summer; but many forget that, along with this, another rise is required for the milk of cows which have been long calved.

Churning should proceed slowly at first, until the cream is well mixed, then at the rate for the churn; but no violent action should be allowed at any time, and when butter appears the rate should slacken. Butter gathered in the churn has more or less buttermilk in it, to be removed either by kneading or washing with water. The flavour is different, but, by the latter method, that of pure butter, and either way can be adopted to suit the taste of the buyers. If the water is pure the keeping qualities are improved; if it contain lime or any impurity it is better without. When the weather is warm, lime is better than pure water for improving the consistency. For this purpose the buttermilk is by some removed and replaced by cold water, as described in treating of Ireland.

The Working and Salting of Butter.

The working of butter is better accomplished by pressure than by rubbing or sliding it along any surface. Machines for the purpose are to be recommended, rather than the hot hands of a manipulator. The temperature should be about 58°, and no more strokes than needed should be given. Salting takes place after the buttermilk is expelled, and should be thoroughly worked into the butter. Set aside for a few hours for the salt to dissolve, it is afterwards reworked, so as to make it keep long and well. Salt is good when it keeps dry only, and from ½ to 1 oz. to the pound is used, according to taste; but the smaller quantity is quite sufficient to prevent the butter from spoiling. An addition of from 5 to 8 per cent. of saltpetre, used along with a proportionally smaller quantity of salt, will, as an antiseptic, have a better effect. Sugar is sometimes used in this way, but the sweetish taste is to most persons objectionable. The making

of fresh butter is so obviously like the description given to salt that little need be said in regard to it. The common way is to make fresh butter up in rolls of pounds or half pounds each; but it is also often made up in prints and fancy pieces of every conceivable shape, and giving evidence in some instances of considerable artistic skill. Shells, frosted leaves, and many other designs, are faithfully portrayed; and a description may be given of how it can very simply be formed into minute cylinders. The instrument used is of tin; a hollow cylinder open at one end to receive the butter, at the other there are only small perforations through which the butter must escape on being pressed with a wooden plug or roller fitting closely to the inside. Thus escaping as tiny cylinders, it resembles macaroni, and has rather a tasteful appearance on the table.

The Packing of Butter.

To preserve butter, or to put it in a convenient form for transport, it is necessary that it do not come in contact with the air, that it is not readily affected by alterations of temperature, that there is no damage or loss on account of leakage, and that from the vessel itself it receive no impure taste or flavour. In all metallic vessels there is the difficulty of their being ready conductors of heat, and a still greater difficulty in their liability to corrosion by the salt and lactic acid. Wooden vessels, if properly made and seasoned, have not, for cheapness and efficiency, been superseded, and are much more extensively used than any other. Made of oak, ash, or similar wood, and having the original sap removed by boiling water or super-heated steam, there is little damage of any abnormal taste or flavour being—through the vessel in which it is packed—imparted to the butter. But to prevent any danger, the vessel should be soaked in strong brine—made from pure salt—for at least forty-eight hours; when this is emptied out, it should be again filled with boiling hot brine, and when it is thoroughly cooled the vessel is then fit for use. The heads require the same treatment, as they, too, come into contact with the butter. The grain of the wood is, by this treatment, so filled with salt as to prevent air getting in. No flavour or taste can exude from the cask, and the butter next the wood will be as good as that furthest away from it, which would not be the case if soaked only in water or cold brine.

In packing, the first process is to spread half an inch deep of salt on the bottom, after which the butter is filled in perfectly solid, and with each succeeding layer the finger is run round the edge to smooth it into the cask, so that the air cannot enter between. When there is only room for a similar layer of salt between the butter and the lid, a piece of muslin of the same

shape, but half an inch more than the lid in diameter, is put on the top. The edge of the muslin is, by a thin edged tool corresponding to the edge of the cask, trimmed down between the butter and the cask. The layer of salt is now spread, and over it the lid is firmly fixed. If the butter is intended for long keeping, the cask is turned with the bottom side up, in which an auger hole is made. Into this is poured hot brine, until it reaches the top of the stave, and thus with the entry of the brine air is excluded, and the hole is then plugged. Butter, if good to begin with, will, when thus treated, go round the world, and be sound at two years' end. Tubs, usually too heavy, and being more difficult to fasten, have not grown in favour. The old-fashioned earthenware crock is very suitable for the preservation of butter, but the cover is difficult to fix, and from its fragile nature is best suited for short transit, and under the care of interested parties.

Irish Notes.

Irish practice is similar to British, and the prize essays of the Cork Agricultural Society, newly published, present no very distinctive features. The milkhouse recommended, and so far adopted, is one with mud walls and thatched roof—these being in a high degree non-conductors. The roof is also to overhang and be supported with posts, so that in the space thus created the vessels can, without getting wet from rain, have access to atmospheric influence. No direct access to the kitchen and scullery is to be tolerated, and one of the essayists would prohibit the entry of any one with shoes which had been used outside. The whole three of the Cork Society's reporters have, however, failed to get hold of the scientific reasons for the regulation of volume, depth, and temperature, and each of them is treated independently of the others. No mention is made of lappering or acidifying, a practice which certainly must be known in Ireland. Broad and shallow setting is recommended with a temperature of 55° to 60°: the first prizeman more than once asserting that at the former "cream is best generated," and that cream "will not readily rise" below it. He advises the use of the refrigerator for milk to be set for cream to rise—a practice defying the benefits to be derived from the more steady falling of temperature and the consequent difference of specific gravity between the milk and cream, and which allows the latter to rise more quickly and perfectly. In speaking of "another mode of producing excellent butter," he considers the raising of temperature to 140° as being for the purpose of dispelling odours, but the practice is connected with the better scientific knowledge of America and Sweden than Ireland, and is, no doubt, for the purpose of giving a wider range of temperature in falling, and

even farther extended by ice application. The application of nitre, boiling water, and sour cream, are considered to dispel the flavour induced by cabbages and turnips. The abstraction of the butter milk, and the repeated substitution of cold water at the finish of the churning process, is recognised in all countries in which hot weather renders the butter "soft." But all through, and especially in the experiments noted in cream raising, it is obvious to a very elementary scholar in the technical education requisite for butter making, that the chemical bearings are a hidden mystery.

The packages for export are considered too large—at 60 to 70 lbs.—for the smaller Irish makers; for they have either to wait too long to fill one, or enter into partnership with a neighbour. In the "midlands," however, they are much smaller, and of a tub shape, and the whole of them are manufactured from white oak. The cylindrical shape, admitting of being rolled about, is now giving place to one wider at the top than the bottom. Over salting, reaching as high as 6 or 7 lbs. to 70 lbs. of butter, is condemned as "penny wise and pound foolish."

Foreign Notes.

In Europe a line drawn from the Pyrenees through the Cayennes and the Alps, and along the lower Danube to the Black Sea, or east to west obliquely from 43° to 46° N. lat., would almost separate the butter from the oil countries. In Italy, Spain, Portugal, the south of France, and the south of Turkey, butter is an article of limited consumption, being mostly sold in very small quantities from the shops of the apothecary, and superseded by the oil of the olive groves of those countries. On the American continent butter making is extensively carried on in 36° N. lat.; but it must be borne in mind that the influence of the Arctic and Pacific currents makes the temperature much lower than at corresponding European latitudes.

The butter manufacture of Great Britain does not exceed 550,000 cwts. It obtains 400,000 from Ireland, and from abroad are imported 1,600,000, the largest proportion of which is from France; next in order following Holland, Denmark, Germany, Belgium, Canada, and the United States. From February till April, Kiel is considered best; from April till October, Normandy and Friesland; and from October till February, German and American brands are in favour.

France.—The best salted butter is exported from Normandy, made from the Jersey cow, and finds its best market in Brazil. It is first packed in small firkins, of which a number are closely packed into a cask, the interstices filled with brine, after which the

cask is firmly kneaded so as to exclude air, and the butter is then warranted to keep for three years. Its largest export of butter is, however, to England—in 1876 reaching a value of close on £4,000,000 sterling. A lesser quantity is sent to Belgium, South America, and the West Indies. That which finds its market in Britain is mostly fresh, and is made as follows: The butter is churned from very sour cream, washed in the churn, and not salted at all. The keeping qualities—evidently not of a high order—are not very material, for it is all consumed in a few days from the time of its manufacture. It is put up in 1 lb. rolls, covered with jaconet and lace paper, and packed in boxes $14 \times 9 \times 6$ inches each, holding twelve rolls, and furnished with appliances for refrigeration. One M. Lepellatier exports 1200 boxes a-week. The best butter for home consumption is put up in large balls—28 to 40 lbs. each—covered with flannel, and packed in wicker baskets; the second and third class being put up in 1 lb. rolls and packed in grape leaves. In experiments with the raising of cream, as related in the "Journal D'Agriculture Pratique," it is demonstrated that milk newly drawn, and submitted to temperatures varying from 0° to 36° Centigrade,* and kept at the same initial temperatures for twenty-four to thirty-six hours, gave the following results. One vessel at 22° C. gradually increased in cream from 4 cubic centimetres—in a volume of 200 of milk—in one hour after the milk had cooled to the same temperature as the water in which it was immersed, to 11 c.c. in fifty-two hours from the same time. One at 15° C. almost similarly rose from 7 to 12, while, very strange to say—one at 2° C. as gradually fell from 29 to 17 during the space from the one till fifty-two hours. The conclusions arrived at were, 1st. That the nearer the setting temperature to 0° C., the faster will the cream rise; 2nd. The cooler the temperature to which the milk is submitted, the greater will be the volume of cream; 3d. The proportion of butter also is greater with the cold setting; 4th. That the skim milk, butter, and cheese, are beneficially affected by a low setting temperature. Twelve hours was considered sufficient time for the cream to rise when cooled to 2°, twenty-four hours at 6°, and thirty-six hours when only cooled to 14° or 15° C. Butter made from milk cooled to 2° was fresh and sweet at fifty-two hours; while that to 15° did not give butter of so good colour or flavour, and it became rancid in thirty-six hours. It cannot here be fully explained why these experiments may in the highest degree be misleading—the foundation of the erroneous teaching displayed being the treating of temperature without any due regard to the correlative ones of depth and volume.

* To convert into Fahrenheit, multiply by $\frac{9}{5}$, and add 32.

Denmark.—From this country there is exported annually—principally to England—but also across the Equator, to China and Japan, an amount of butter, partly purchased from other countries—representing a value of nearly £2,000,000 sterling. The general practice in regard to setting is that invented in Sweden by Swartz of Hofgarden, and what is known as cold and deep setting. But in 1878 M. Fjord, of Copenhagen, having received a grant of £800 from the Danish Government for the purpose of carrying on research in the treatment of milk and the manufacture of butter, has demonstrated that, by a centrifugal cream separator, more cream will be given than by any of the common methods. But in the experiments it ekes out that, when set in wooden vessels, the cream was only 4½ per cent. short; proving that the cooling was too quickly gone through, and that it was only by chance that in one of the methods volume and depth had been graduated to suit the lowest point of cooling. In a subsequent experiment, the centrifugal method, the ice cooling and that of setting in wooden vessels came more nearly alike. It is not, however, claimed that in summer the machine will excel the ice method—it is only superior in the case of milk which is sluggish in throwing up the cream; thus proving that, after all, the supposed increase is due to want of management in the other methods. However, if the machine is more certain, and without the care and calculation necessary for the other methods, it will still be an improvement. It separates the cream from the milk in thirty to forty minutes, and one for 20 gallons requires three horse-power to drive it. The price is £150, and on that account alone will not soon be in general use.

The following is an account of the packing of Danish butter as practised by a company exporting 2½ millions of pounds annually. The tinned-iron boxes are made on the premises of material procured in England. The sheets are cut into strips and bent by machinery. The edges are then soldered together, and the bottoms and lids are also made by machinery and turned up at the edges. The bottoms being next soldered on, the boxes are first steeped in hot water, then in a soda lye, and, lastly, are thoroughly rinsed in cold water. The cellar where the packing proceeds is one-half underground, 3 metres in height, and ventilated by a rotating apparatus which effectually removes the smell of the butter. The temperature is maintained at 59° Fahr., and the casks contain 150 lbs. each. Only pale-coloured butter, slightly salted and made from sweet cream, is admitted. The company buys up butter in Sweden, Norway, and Germany; and their factor gets £1000 a-year. The butter is received from those countries in wooden casks; and the outsides of the butter are—for fear of a taint from the wood—pared and sold to retailers at a reduced figure; then, cut into flat pieces with an iron wire, it

is kneaded together by machines of American construction, during which process a little salt is added, after which it is packed in the vessels described. A little round the edges is removed to give convexity, and the covers are then soldered on in a current of air calculated to remove the smoke and acids generated in the process. The closed vessels are then rubbed with sawdust and paper dipped in a solution of aniline violet, and set on a perforated table to drain. The labels are then affixed. The tins are packed in larger wooden boxes bound with iron and having the vacuities filled with rice husks, and, being finally headed, are considered ready for export.

Norway and Sweden.—M. Dahl of the Agricultural School of Arts in Norway is responsible for the following:—160 quarts of milk, on being submitted to a temperature of 3° C. for thirty-six hours, produced 240 lbs.* of butter; while from the same quantity in the same time at 18°, only 210 lbs.* were obtained. The comparative return would have been still more in favour of the low temperature at twenty-four hours. But a very full and clear description of butter-making in that part of the world has been furnished to the writer by Axel Bergwell, Esq., a gentleman who, along with another Swede, visited this country in 1875, and inspected a few of the larger dairies in Galloway.

In describing the system invented by Swartz, he proceeds as follows:—The cisterns, made of wood, are 2½ to 3 feet high, 3 feet broad, and with the length depending on the quantity of milk. As the milk varies in quantity throughout the year, it is better to have three smaller than one larger one, on account of economy in the use of ice for cooling—the principal element of the system. The depth of the water is kept at its proper place by having a hole bored in the cistern at which it may escape. Five inches from the true bottom there is a false or lattice one on which the milk vessels are set. The temperature preferred is below 4° C., only attained by the use of ice; when cold water is used, lower than 6° or 7° is rarely obtained. The vessels in which the milk is cooled are of iron covered with tin, oval shaped, 2 feet deep, 1½ foot at the broadest and 7 inches at the narrowest width. These milk vessels are filled to within 3 inches of the top, and hold 9 imperial gallons. They are set on the lattice bottom with the surrounding water in a horizontal plane with the top of the milk, and with 6 or 7 inches between them, so as to allow the ice to be packed between the vessels as well as between them and the sides of the cisterns. Thus the milk is reduced to 4° C., and, if properly managed, will fully separate the cream in twenty to twenty-four hours; and less will be gained in increased quantity of cream than will be lost in quality of it and the skim milk, and in ice consumption by any further delay.

* Evidently 24 and 21.

Running water will not separate the cream so quickly; but, if not more than 6° or 7°, it will separate in thirty-six hours. It is thus a matter for calculation whether the cost of procuring and keeping ice will not more than counterbalance the small loss of cream. By the method described, the milk keeps sweet for a week; and less number of vessels, less room, and, consequently, less cleansing are required.

He then describes the making of butter thus:—There are two ways of making butter in Sweden—either by churning sweet cream, or by letting it get somewhat sour. The latter gives more butter by exact experiment, but it has a stronger aroma; still, churning from sweet cream is becoming more common, partly because it is a trouble to notice the exact acidity required, and partly because the skim milk is so much better for cheese making. Churns, as a rule, are wooden; the Holsatian churn, in which two vertical wings are driven by horse-power, being the the most common in the larger dairies, the other being the common box with a round bottom, and the dasher driven by an ordinary handle. The cream at the beginning should be 13° in summer, 14° to 16° in autumn, and 16° to 18° in winter. The temperature is, however, regulated by the place as well as the season, and the condition of the milk has also an influence. Strict observation will, however, find out the proper temperature for every place and under every condition. If atmospheric changes render an alteration of temperature desirable, it should be by cautious movement, not more than ½° at a time. Churning should be slow at the commencement, and increase gradually to the required speed, after which even turning without interruption will secure the best results. In about half an hour the cream should commence to break—found by a grainy feel on the finger. Especially in summer, the temperature rises in churning, and cold water or ice should be used to bring it to the starting-point; this will make the butter more solid, and assist the separation of the butter milk. If ice is used, it should be broken small. Often in winter it is requisite to raise the temperature, and this should be effected by adding, in small quantities, water of from 35° to 40°. When the butter is formed and pretty well separated, the speed should be slackened, and a few slow turnings will make the butter ready for removal. Altogether, the time occupied should not exceed forty-five minutes, or else, if got as otherwise directed, the butter will not be good and solid. In warm weather, if the butter milk is not to be sold, one-third to one-half cold water can be added to the cream; but warm water in winter must be sparingly used. Sometimes butter comes too quickly, then it is soft and greasy; sometimes too slowly, so that several hours are spent in getting what is generally bad butter; sometimes it cannot be got at all. The management mostly

accounts for the difficulty; for bad fodder, frozen turnips, and especially potatoes, or a large quantity of sour distiller's waste, will all more or less injuriously affect milk and butter. Disease of the udder causes either bad butter or none at all.

The cream-separator mentioned in connection with Denmark has been eclipsed by a Swedish engineer named Laval. It requires only two men to drive it, and its action is continuous. When kept in motion and supplied with milk, cream is delivered at one spout and skim milk at another. It is cheap compared with the Danish one,—£25,—and is said to give better results in cream and butter than any known method, only three-tenths per cent. of fat being left in the buttter milk. Thus, in 1000 lbs. of cream, only 3 lbs. will go into the butter milk—looking like the acme of perfection in this direction.

Switzerland and the Tyrol.—In Switzerland, as soon as the milk is drawn it is filtered through a sprig of washed fir-tips, the stem of which is inserted in the narrow opening of the dish used for the purpose. Hairs, clots, or gelatine sliminess, are deposited on the wiry leaves—in fact, it answers all the purposes of a sieve, and is all the time imparting an agreeable flavour to the milk, and, to a less extent, also to the butter. A fresh sprig is used every milking. In the Tyrol, milk is set in small shallow pans and cooled with ice or compressed snow, and the cream rises in twelve hours. The temperature is here, as in the French experiments, too much relied on; for shallow setting will certainly cool the milk so quickly that in cold weather especially, a loss of butter will result.

Germany.—The greater part of German butter is known as Hamburg, and consigned to the English market. Schleswig-Holstein furnishes the largest quantity and best quality, next comes Mecklenburg, then East and West Prussia. The butter designed for export is coloured higher and more salted than that for home use; and thus some of the provinces, which have only a moderate status in the English market, stand high in Berlin. In South Germany the butter is never salted, and taste and consistency are of much more account than colour. Preserved butter is also made, and, hermetically sealed in tins, is mostly exported to tropical countries. The setting of milk and the raising and churning of cream into butter, are very little different from the practices of Sweden and Denmark in the north, and Holland and France in the south.

America.—The whole economy of butter making is in this country either a modification of, or more generally an improvement on, the methods practised in Britain and Sweden. The former may be reckoned the patron of shallow setting, the latter that of deep; and it is not difficult to see that both methods may be justly approved where, as in America, there is such a wide

range of latitude and temperature; but deep setting, large volume, and cooling to a low temperature, have now most advocates in America in the rather low temperature of the dairy belt, and the competitive experiments of Hardin and Reeder endorse this practice. The former, by his plan of deep setting, got 1 lb. of butter from 17 lbs. of milk; the latter, by the shallow plan, took 19 lbs. for the same quantity—both being from the same quality of milk, that of Jersey cows. In a subsequent trial the deep system maintained its superiority, and gave 1 lb. of butter from 14½ lbs. of milk. It is, however, quite evident that, even although the deep system is preferable, it would be neutralised by the expense of procuring and keeping ice in warm countries, and in this America, Sweden, and other comparatively cold countries have an advantage. The buildings in America have many devices for regulating and controlling temperature, and this it is evident that we should imitate. Double walls, with the intervening space stuffed with the refuse bark of tanneries or sawdust, cisterns, and streams of cold spring water, all are called into play for giving the temperature desired. In the storing of ice there is also something to be learned; and it is quite possible that by and by, even here, every farmer will have an ice-house. In a sheltered place and facing the north an underground receptacle, properly drained, with double walls stuffed between with bark and a thick thatch roof, would, at little expense, give ice the year round, and be useful among others for the purposes of the dairy. The factories where butter alone is made are, in America, distinguished from those where skim milk cheese is also made by terming the *latter* creameries.

The Americans, too, have found out that more butter is had by allowing the whole of the milk to acidify than by raising the cream. By experiment, 28 lbs. of milk by the former method gave 1 lb. of butter, while by the latter it required 38 lbs. But they have also discovered that, when skim milk cheese is made, the apparent loss in butter is turned into a gain in the better quality of the cheese. Whey butter is also sometimes made,—200 lbs. of whey giving 1 lb. of butter, but it is greasy and strong flavoured.

The methods of setting milk in America being different from those practised in any other country, it is important to notice some of those most highly approved. Hardin's method, previously noticed, consists in emptying the milk as drawn into deep cans, which are set in a wooden box constructed to hold a number, and excluding the air entirely. A shelf above is filled with ice, and the water from the melting ice runs through a perforated margin below the cans. The milk is 18 inches in depth, stands in the water to a depth of 4 inches, while the surrounding air is 49° Fahr. The cream is taken off in about

thirty-six hours, and churned at a temperature of 58° in summer and 63° in winter,—forty strokes to the minute usually producing butter in twenty minutes.

Edward Burnett, Massachusetts, has a modification of this plan, applying ice to the upper portions of the cans only, and which are made wider at the top to give a greater cooling surface. The lower portion is then of the surrounding temperature, whatever that may be. His belief is that the cooled milk as it descends leaves the cream, which is less dense at the top; but, like all deep setters of any note, he is profuse in the use of ice, —taking 200 lbs. for every 90 gallons of milk. He also excludes the air.

The Cooley system is the newest, and getting a popular one. His pans are 20 inches by 8 inches broad, and, like the preceding, they are enclosed in a box as soon as the milk is drawn. Each can is covered with a small pan like a milk plate, with the convexity upwards, and held in its place firmly by wedges. The box is then filled with cold water, the pans keeping the water out of the milk on the principle of the diving bell. If the water is below 50° a stream of it is kept entering and passing out by an overflow. If cold enough water is not available, ice is used to keep it down to between 40° and 50°, and it is found that all the cream is up in twelve hours, and the dishes are thus ready to receive the next meal. No account is taken of animal odour; but atmospheric ones are excluded by the complete immersion in water. By an ingenious device the skimmed milk is withdrawn from below, and the cream, left alone, is then poured out. This system saves dishes, and with the low temperature less scalding and work are necessary. It is maintained that, from Jersey milk, a depth of 17 inches by this process gave $6\frac{1}{4}$ inches of cream.

Mr James M'Adam, a name well known on both sides of the Atlantic, communicates the following:—Illinois makers heat the milk to 160°, then set it in an air-tight tin vat, encircled with a stream of iced water, which reduces the temperature to 40°. The cream rises perfectly in twelve hours, and the minimum of curd,—well known to affect butter injuriously,—is thus obtained, and the keeping quality improved. This, like the method spoken of by the Irish reporter, gives the desideratum of a long range of temperature through which the milk has to fall in cooling. But it would be interesting to find out whether or not the common complaint of American butter going off flavour is due to the exclusion of milk from the air before the animal odour has time to evolve.

The curing and packing is similar to that practised in Britain. Earthenware jars are used for home consumption, but they are much better fastened than those in use in this country. The

wooden cover has turned hooks, which fasten to a projection on the jar, and which can be screwed together until the fit is a fast and air-tight one. This also helps to save breakage in moving, and when closely packed together. The butter remains long in a good condition, as the cover excludes air, and the stoneware is a bad conductor of heat.

It may, then, be concluded that with a normal temperature of 40° to 70° pretty uniform results may anywhere be obtained. The lowering of the temperature through a long range is no doubt an advantage, but this should only be done gradually, and deep setting is thus inseparable from the use of ice and very cold water. Raising to 160°, as in Illinois, might reap a long range without the use of ice; and it would be interesting to find out how much it differed, in falling from 160° to 50° or 60°, from that between 90° and 30°. No doubt the shrinkage would be greater at the higher temperatures than the low ones, according to the research of Arnold; but to what extent it would affect the butter product has not evidently been solved. Shallow setting and small volume will, although evidently inferior to the other, maintain their pre-eminence in warm and even temperate countries; for against the gain in butter has to be put the loss in skimmed milk for cheese making, or even butter milk for pigs, and the expense of procuring and keeping ice. With low temperatures the consistency and keeping quality are improved, and, if air is not excluded, the flavour would also be better. The superiority of the flavour of the best English and French, with shallow setting, and of Swedish and Danish, with deep setting and contact with the air, as contrasted with American, leaves little doubt as to the cause of its becoming coarse in flavour. But it does not, however, follow that in this country we would not improve by adopting, to a considerable extent, the use of cold springs and ice in reducing the temperature of milk in the summer season; and for this purpose a closer investigation of foreign methods, with a greater experimental range at home, might lead to more eminence in butter manufacture. The greatest wonder is, however, that in all butter countries the reasons for studying in correlation, the volume, depth, and temperature are but little known; and until a more general knowledge of them is attained success in butter making will be irregular and uncertain.

Percentages and Quantities.

In spring, or about six weeks after calving, milk is at its poorest, and gradually gets richer until the cow again comes in, —unless that be protracted till another year. The standard of analysis is 8 per cent.; in spring it may, on food deficient in

fat-forming material, be slightly under,—even without added water; but as the season advances it increases up to 13 per cent. In the course of a season the variation has been found by analysis to be from 5 to 18 per cent. in one animal, while the average was about 10 per cent. But the percentage differs much in the different breeds, and different animals of the same breed. Jerseys will have at least 2 per cent. more cream than Ayrshires, and Shorthorns and Holsteins will vary little from the latter. About two gallons or 20 lbs. of milk, with 13 per cent. of cream, will give 1 lb. of butter if lappered, and one-third less if the cream be churned only. J. C. Morton considers that 26¼ lbs. of milk will give 1 lb. of butter; the writer has always calculated 25 lbs. when allowed to acidify. With Galloway cows it has been known to be done, even with cream raising, at 16 lbs.; in fact, the owner would not keep a cow when she failed to give her ounce of butter for her pound of milk. And in the cream raising experiment of Hardin and Reeder in America, already noted, from 14½ lbs. to 19 lbs. gave with Jerseys a similar result. Even 12½ lbs. has been credited with 1 lb. of butter from a Jersey; and if the cow was one of butter-producing tendencies, and fed with highly concentrated food, it is not incredible. Cream rises much quicker from the milk of stall-fed cows than those grazing on an ordinary dairy farm,—as much on the former in twelve hours as on the latter in thirty-six hours. An additional 2 per cent. is got by skimming twice during an ordinary setting—say twenty-four hours. Milking three times a-day gives more butter to the same milk, as well as more milk; and it is not well known whether or not the less percentage of fat with two milkings is re-absorbed into the cow's system. A good cow will produce, with liberal feeding, 500 gallons of milk in a year; and from that quantity 200 lbs. of butter can be manufactured. A large margin above and below is the result of varied practices; more usually above with a single cow or a very small herd, and in the other direction with large ones.

ON THE REPLANTING OF WOODLANDS.

By Thomas Wilkie, Ardkinglas, Inveraray.

[*Premium—Three Sovereigns.*]

The majority of writers who have treated upon the replanting of woodlands have uniformly agreed that a thorough clearing of all the debris of the former crop is absolutely necessary,—with this I also quite agree. But, as several of those have stated that three, five, or eight years are only necessary to elapse between the clearing of one crop ere the replanting of another of the same kind—when they guarantee success—I consider this is calculated to mislead the inexperienced.

I venture to adduce a few facts thereon, and affirm that perfect success from replanting conifers after conifers will not be obtained simply by clearing of debris, drains, &c., and replanting either at three, five, or eight years after the former crop has been cut down. For, as the pine beetle (*Hylobius Abietes*) has often been found very destructive to the second crop in its early stages of growth, so has that of fungus been equally destructive to plantations of various ages, after the beetle referred to has ceased its ravages.

I shall not necessarily inquire whether the soil still retains ingredients calculated to nourish a second crop of the same kind. But I may state that, without some means of nourishment being supplied to the ground, a second crop of few kinds are equal to the first, except in cases of newly improved land. Neither have I seen natural reproduction of a second crop of timber take place, till upwards of twenty years had elapsed after the former crop had been cleared,—thus, according to analogy, a second crop of the same class cannot reasonably be expected to equal the first if planted at an earlier date.

I saw 30 acres of woodland replanted with the same kinds—viz., larch, Scotch, spruce, and silver firs, and a few hardwood plants,—with the view of enhancing the landscape effect, and this on ground cleared at various dates, from six months to upwards of twenty years before the second crop was planted, with the result—not what those authors referred to hold out, but found a very considerable number of the plants destroyed both by the beetle and fungus; this not only on recently cleared portions of the ground, neither on sections closely adjoining thereto which had been cleared at a remoter period, but on sections isolated from those on which any coniferous tree had grown, and distant from them at least 150 yards, while the fungus destroyed a large number of plants also on sections which had been cleared at various periods ranging from eight

to twenty years. Of course a considerable difference existed between the class and nature of the soil, and to this difference I attributed the fungoid attacks, which, if correct, clearly proves that every kind of conifers do not succeed well after the same; and though some have stated they have larch growing well after larch, it must be called exceptional; and such class of soil should be carefully defined and periodically examined, not only immediately after being cleared, but also annually after being replanted, for at least the first twenty years, with a view to ascertain at what period the beetle and fungoids cease to act upon the plants. It has recently been distinctly stated to a company of arboriculturists, by one of the most experienced replanters of the present day, that he finds larch does not succeed larch well. I might state in my experience, which is considerably less than that of the person referred to, I never found it growing anywhere equal to the first as a crop, though an ultimate crop may succeed in battling against those injurious attacks. In this plantation to which I have referred I found the beetle and fungoids sometimes both at one place, at other times widely separated. Hence, until we can arrive at an approximate date, at least, when natural reproduction takes place, and at what period of time after the former crop has been cleared both the beetle and fungoids are produced in different kinds of soil, we cannot, in my opinion, positively state how long a time should elapse before we attempt replanting land with the same kind of plants, with the assurance that our efforts shall be crowned with success. Some authors seem to hold the belief that this beetle is propagated in the wasting branches of the former crop left lying on the ground; but, though I have carefully examined branches in all stages of decomposition, I never yet could get any trace of it on any of a less diameter than 6 inches; but, on limbs or tops of trees having this or a greater diameter, as also in old stocks in the ground, I have found not only the insect, but the larva also, and the eggs only on wasting timber, whether lying on or standing in the ground—including old gate and other large posts. Thus the difficulty in escaping its attacks is consequently very great, seeing in many plantations such nurseries are very numerous.

Possibly, with a view to satisfy the inexperienced arborist, and to make the difficulty appear the more plain to all, I had better introduce a few queries in connection therewith—these embracing any question of importance that might naturally arise,—and, by giving a plain and intelligible answer to each, trust it will be of more practical utility than by simply stating my experience of the destructive habits of this forestal enemy. For, while many authors studiously recommend the adoption of certain practices or systems, few care to relate their failures;

but unless failures are known, anyone may unwittingly commit the same mistake. Hence I consider that one's failures, if plainly and truthfully told—especially when they have adopted means highly recommended by others—may be more useful than should they have simply to concur with these authors.

Q. 1. Some authors have recorded that their experience of the beetle's ravages are entirely confined to ground recently cleared of a coniferous crop, and believe such are propagated in the wasting branches on the ground. Do you not concur in these statements?—A. No, not entirely; seeing I have known plants destroyed by this insect on ground which had formerly been cleared at various periods from six months up to twenty years, and also on ground isolated from where any coniferous crop had grown by at least 150 yards, and this though the branches of the last crop had been all carefully gathered up and burned.

Q. 2. Then to what do you ascribe their propagation if not to the wasting branches left lying on the ground?—A. I ascribe their propagation to the fact that, though after each periodical thinning the branches were carefully gathered and burned, yet, should trees die and be left standing in plantations for any length of time, or should coarse valueless pieces of timber be left lying on the ground, old gate or other large posts be allowed to waste near a plantation, and in stocks made by such thinnings,—this insect would increase to a larger extent than it otherwise would do were dead trees immediately cut down, and those and all other wasting pieces of timber cleared off the ground, and the stocks covered with 6 inches of soil.

Q. 3. Then to your mind, at least, it is quite evident that wasting branches, if of a less diameter than 6 inches, are not what many believe to be the only nursery for this forestal enemy?—A. However phenomenal it may appear, to my mind it is perfectly clear.

Q. 4. Those authors must have had some reason for forming this opinion ere they would state such a thing?—A. They may have taken the larva of some other insect for this one, and consequently arrived at this conclusion, though I cannot hold it as a sound one; or it may have been the case that one author made the mistake in judgment, and others having believed it, continued the spread of this belief.

Q. 5. What effect would the covering of the stocks with soil have upon the propagation of the insect?—A. I have often seen stocks incidentally covered with soil or turf by dragging, or by way of clearing out drains; and when I

have carefully cleared off such soil, I never yet saw or found any signs of this insect's work in them, but invariably found them being speedily reduced by the action of fungus; and, as they are excluded from light and air, they are more likely, in ordinary circumstances, to decompose more rapidly than if part of them should be left exposed to both of these.

Q. 6. Then your opinion leads you to the conclusion that the covering up of the stocks would be a means, at least, of reducing their number in any plantation.—A. Exactly so.

Q. 7. And you also believe that by carefully removing all large branches, tops of trees, old gate or other large posts, from the neighbourhood of a plantation—particularly of young ones—that this is the most likely way of retarding, if not of entirely reducing, their means of propagation.—A. I believe those means are the most likely.

Q. 8. But if you have not found them very injurious to the young plants composing the second crop, in your experience, where wasting branches lay on the ground, other authors state they have found it so?—A. The insect, being a migratory one, will alight on any object which readily presents itself where the herbage does not completely cover them, and the insect may be tempted otherwise through hunger to go in quest of food; and the young newly-introduced plants, constituting a part at least of their food, are speedily seized upon and soon injured—if not killed outright.

Q. 9. Then to what do you ascribe those isolated attacks as having been observable in the plantation you refer to?—A. A number of the insects might be nourished and harboured in a large old stock for a very great length of time, particularly if such a stock were in dry porous soil, or in a soil where fungus would not very soon attack it; and if left uncovered, as referred to, numerous insects would find a suitable lodgment therein. But as I almost invariably saw those isolated attacks were made on little knolls or the slopes of the same, or where the herbage was very scant, I attribute such attacks chiefly to the migratory habit of the insect, and partly to the fact that they may have been harboured in stocks such as those to which I have just referred.

Q. 10. Then you stated that fungus is often very injurious to young plantations, generally after the beetle has ceased its ravages; how did you observe this?—A. In several sections of the young plantation I have referred to, I found fungus and the beetle both at work, though seldom attacking the same plant at one time, though acting in

close proximity to each other, and at other places entirely and distantly separated. Fungoids being spread over the most of the ground where the former crop had been cleared for a length of time, while in several places only newly cleared as well. They attacked the roots of the young plants, and, ascending upwards, by the time the plants showed signs of lost vitality, reached a few inches above the surface of the ground, though in many cases, after pulling up a dead plant and carefully examining it by aid of the microscope, it could not be seen much above the common axis of the plant.

Q. 11. Then how do you account for its attacks—not only on the remotely but also on the newly cleared ground?—A. In the former case, according to the law of natural decomposition, the old stocks were often completely overrun by fungoids, while stocks left at certain dates by thinning of the plantation were also attacked: consequently such injurious effects upon young plants are easily accounted for.

Q. 12. But you did not state you found this over the whole of your young plantation?—A. I only found it on certain spots, which I attribute to the nature of the soil; but I firmly believe it must either have gone, is now going, or will ultimately go, over the whole of the ground where the plantation has been formed.

Q. 13. These facts, if indisputable, clearly prove then the difficulty of rearing a second crop of the same class on ground formerly cropped with timber.—A. These facts are indisputable; and unless plants which are either impervious to the attacks of such fungoids, or capable of surviving them, are introduced, the replanter will be caused grief.

Q. 14. But you must have seen natural reproduction of the same kind of plants in the plantations under your charge, and, if natural reproductions are produced, analogous reasoning would lead me to the conclusion that replanting can profitably be done as well, and the more especially that various authors have recorded the fact of replanting succeeding admirably, even when the same kinds were introduced, and grow to profitable dimensions.—A. No experienced arborists can deny the fact of natural reproduction, and I have frequently seen it in the case of the Scotch, larch, and silver firs, though not so often in that of the spruce or the larch; but in the case of each, the reproduction is never extensive for a considerable time after the former crop has been cleared, though a few natural plants may be seen occasionally in certain parts where

some timber had been blown down, or where, by some other means, the surface of the ground had been broken, and a suitable bed been formed for the seed to lodge in. Many practical arborists can also testify to the partial or complete failure of certain kinds of plants when used for forming a second crop, and if such testimonies were fully recorded more could testify of the latter fact than of the former, and, I may state, that if such authors lived to see their plantations after being thirty years planted, they would also corroborate the latter class of arborists.

Q. 15. Why do you think so?—Because, as I have formerly stated, not only the beetle, but the fungoids also, must overrun the greater part of the ground—and larch being very liable to be injured by the latter, while Scotch and spruce firs are more or less so, any person having replanted, either at three, five, or eight years after the former crop had been cleared must have seen a very considerable amount of injury done to those plantations by the fungus at some stage of their growth, depending chiefly upon the different classes of soil, as well as the porous or retentive nature of the same. But I consider it absolutely certain that in course of thirty, if not at twenty-five years, it would have overrun the whole of the plantation; and, I again repeat, if the kinds selected have been entirely the same, the planter would not find entire satisfaction in seeing his plantations after that date. I have seen partial failures where replanting had been done immediately, as well as at various dates after the former crop had been cleared, and notably in one about thirty years planted, which had been formed eight years after the former crop had been cleared. The soil was a porous one, various portions had failed at various dates, but at this age it was deemed advisable to effect a total clearance of the larch, as scarcely a sound tree could be found in the plantation, though the Scotch fir had grown to a fair proportion, and continued to show a healthy and vigorous appearance.

Q. 16. Then, according to your statements, a very great amount of risk is run by proprietors in attempting the replanting of woodlands with the same kind of trees, particularly larch?—A. A very great amount of risk indeed.

Q. 17. But you do not consider any other kind of fir so liable to injury by fungus as the larch?—A. I have not found any other so liable in my experience, though I have seen both the Scotch and spruce suffer considerably, and never the silver fir at all—by fungus—nor by the beetle either.

Q. 18. Then what kinds or system of replanting would you adopt where a mixed crop of the above mentioned kinds

had grown ?—A. The kinds and system of adoption is not left generally in the choice of the party in charge—neither is the demand in each locality of equal proportions. But, if left entirely to my own choice, and the growing of a useful and valuable crop of timber being only expected, I should carefully avoid planting the larch, at least on any portion where it is questionable that the fungus has not ceased thereon. The other kinds named, mixed with a fourth of hardwoods, where soil is found to answer them, which I have recently carefully defined, I would promiscuously distribute, so that, should one class fail to grow either to useful or valuable size, I could expect with confidence that I should be able to have a valuable crop of a mixed kind on the ground—the one part would form nurses for the other during the early states of growth, and, though a considerable number of one or several classes should fail, still it would only be reasonable to expect, a full crop would survive; and should I be confined to the selection and replanting of one particular kind of coniferous trees, the Scotch is the one I should select for planting in preference to all the others.

Q. 19. And with a view to plant at a time when you would expect least injury to be done to your plants, what date, after a former crop was cleared, would you select for replanting ?—A. Should the first crop be cut down and cleared during the autumn and winter months of this year, in order to give plenty of time for the thorough clearance of all debris clearing of drains, and fencing, &c., I should select the second spring after the final cutting down—if the precautionary measures I have named had formerly been carefully attended to—but if not, local circumstances, such as those I have adverted to, should determine the proper time to select for the operation.

Q. 20. Is bleeding of the larch an infallible sign of fungus in the ground ?—A. The bleeding or blistering of larch are neither of them certain signs of fungoid attack upon the plant, though these signs are indicative of weakness or want of vigour.

Q. 21. Is pumping or heart-rot a sure sign of fungus then ?—A. Yes.

From the facts adduced, some people may be apt to cavil with several of these statements, but till now, though much has been written upon arboricultural science, I firmly maintain this subject has never been treated as it ought to have been; and after careful consideration, with a view to instruct the young and inexperienced, as well as provide some consolation for those who may have found themselves in the same plight in which I myself was

placed, after having carefully attended to all the preliminary arrangements recommended by some authors. And that landed proprietors should test ere they attempt such a system of replanting, as some have been bold enough to lay down for their guidance, I maintain that if any author who recommends the course I have here censured, has a plantation in a healthy and vigorous condition, which has escaped both the ravages of the beetle and the fungus, he ought to invite all interested parties in some public manner to visit such a coveted sight.

I know many practical arborists who have suffered in reputation in consequence of failure in growing a second crop. And what shall we call the loss of proprietors? Both may have been equally ignorant of the fallacy of these recommendations, often so plausibly set forth, consequently the blame rests upon the ignorant and confiding, when the guilty escapes free. Let me, in conclusion, exhort the Highland and Agricultural Society to circulate the following queries in their "Transactions" or otherwise, viz.:—

1. Does the pine beetle (*Hylobius Abietis*) only attack plants on recently cleared land, and that only when the branches and other debris of the former crop was left lying on the ground?
2. Have they been found also on young plants introduced at various dates, ranging from three, five, and eight, up to twenty years, after the former crop was cleared?
3. Did larch suffer from them equally or nearly so as did the Scotch fir?
4. At what date or dates did you observe them on the ground after it was cleared?
5. On what kind of soil, and what subsoil?
6. How long did they continue to harbour in the cleared woodland?
7. How long after the former crop was cleared did you replant the ground? and what success had you with the same kind of plants?
8. Could you specify any class of soil upon which either the beetle or fungus produced greatest injury?
9. Was this injury equal at various altitudes?
10. Did fungoids attack many of the plants; and at what states of their growth did they do so?
11. Were the damages caused thereby equal on all kinds of soil, or was it confined exclusively to one or various kinds?
12. What class or kind of plants suffered most by them?
13. State the condition of the soil before you planted the ground; and how you treated it either prior or subsequently to your planting it, and the results thereof, &c.

Such queries, if once truthfully recorded, printed, circulated,

and answered, would confer an infinite amount of benefit, not only to this but to other countries; and would be far more beneficial than all the recommendations ever given or made upon the subject of replanting of woodlands; and, until such information is carefully gleaned by some society or individual member, we can never authoritatively state the precise period when replanting should be done.

ON PROVIDING A SUFFICIENT SUPPLY OF LABOUR DURING PRESS OF AGRICULTURAL WORK.

By John M'Culloch, Denbie Mains, Lockerbie.

[*Premium—Ten Sovereigns.*]

In contemplating the system of rural economy which best fulfils the desideratum of this report, it may be presumed that extraneous labour, to any great extent, is not included, and that the principal part of the supply must exist on the farm itself. The regulation of the supply, and the varying demand which always will exist on a farm, severely taxes the administrative skill of the farmer,—a fact involving a considerable section of outlay, and consequent profit or loss. It is no uncommon thing for the labour bill on one holding to be less by 30 to 50 per cent. than on another of equal size and gross product, and solely attributable to the difference of scheme and organisation. No doubt other elements,—such as stiff or wet soils, badly shapen and small fields, long distance from railway station or shipping port, a system of stocking and rotations requiring more hands,—adversely affect the farmer as regards labour payments, but none of these affect the comparison instituted. When a holding is being inspected and entered on, the labour question comes to the front. A plentiful supply in village or town in the vicinity may partially allay anxiety in regard to it, but the farmer must not rest satisfied. He must be able to command from a more certain source the great bulk of his supply, and on none can he more absolutely rely than those on his own holding. The expansion of other industries than agriculture has,—especially in prosperous times,—rendered the "catch crop" of labour in towns and villages an extremely precarious one. There is, then, no alternative but to have almost as many workers on the farm as may be able to undertake at any time the press of work to which agriculture is, by fits and starts, peculiarly liable. This labour must be entirely controlled by the farmer: and for this end no system has yet

proved itself even equal to having families of agricultural labourers resident on the farm.

When an arable farm is worked on a five or six course rotation, as is common in the west and south of Scotland, there should be no less than one cottage for every 100 acres. An extra one even is desirable, so that it can be let to a tradesman or other party who will, as part of the rent, supply a worker at busy times. It is readily conceded on all hands that bad cottages,—many we are told of only one room,—have been a fruitful source of the migration of rural labourers into the towns. In accordance with reform in this direction, three-roomed cottages are considered the lowest scale of accommodation which will fairly meet the demands of decency and comfort. Larger ones, with bedrooms upstairs, have been by some landlords erected; but with the present tastes of Scottish peasantry this has reached the other extreme. The three rooms on the ground floor seem as far as prudence dictates in the way of necessary reform. The cost runs from £100 to £125 in single erections, but considerably less when a number are in one building. It scarcely needs to be remarked the nearer the steading, after *one hundred yards*, the better, for distance means, in walking backward and forward, unremunerative labour. On a large holding there is, however, an exception in one house,—usually the shepherd's,—being placed so as to command, on account of oversight of live stock, a view of that portion of the farm which cannot be seen from the steading.

It may then be presumed that cottagers, hinds, cotmen or yearlymen, as they are provincially styled, are the backbone of the system advocated as preferable to relying on single servants lodged in the farm house or bothy, or on the uncertain labourers of towns and villages. The married men are steadier, and as a rule more skilful, and even the unfavourable part of the comparison, on account of the greater energy of youth, is, with the improved implements, which require skill more than muscular labour, fast narrowing. Besides giving a much quieter farm house and steading, the cottager is even the cheaper of the two. Bothy men are not known in the west country, but no doubt are cheaper than those lodged in the farm house, possibly even than the cottager. Having no reliable information as to their cost they cannot well be compared with the cottager, and even although cheaper, there is a prejudice against them in the minds of the community which would be hard to remove. It is believed by competent authorities that they are not objectionable if properly managed—it is the abuse of the system which has brought it into disrepute. The cottager costs £42 wages, £6 house, garden and perquisites—in all £48 per annum. A man of similar ability and skill, and lodged with his master, will cost

£28 in wages, £17 in food, and £8 for proportion of menial servants' wages and the keeping up of bedroom, furniture, and utensils—in all £53 per annum.

But in the family of the cottar there is a fund of labour from which great benefit is derived in busy seasons, and in which lies a great inducement to arable farmers to study and promote their accommodation and general well-being. In the "east country" one worker only is usually bound, while in the west—especially in dairy districts—it is not uncommon to find as many as three in one family bound to "milk and work out when required." The farmer's anxiety for workers and milkers is measured in most part by his system of stocking and green-cropping, and similarly many sons or daughters of the hinds are, in accordance with the demand, bound to the farm or hired out to others. Those cottars whose children are unable to work, or who have none, must take a little lower wage from farmers who do a proportion of their work with their own families, who rely principally on towns and villages, or who have a greater proportion of pastoral than arable land. But those who require the labour of a family will not only be content with a little less muscular power from the cottar himself, but may even give him a little extra wages on account of the labour thus supplied. Reformatories and industrial schools have done a deal in supplementing farm labour at busy times, but stern necessity alone will cause a farmer to apply to such a dear and rather uncertain source. There is a slight difficulty in keeping the families of the cottars regularly employed, and this is rarely guaranteed. Sometimes work can be got on a neighbouring farm, but although desirable for the labourers, a want of authority renders them less useful both in capacity and willingness. The experience of the writer is in favour of regulating the number, so that work can be given during at least the dry days of nine months, after which there is no great practical hardship as the income will show, and moreover they, especially the women, need not be altogether idle. This system keeps the younger members of a family at home with and under control of their parents, and although it is often assumed that their associations in the fields are not of an elevating nature, still they are nowise inferior in behaviour to those hired away from home. To town or village workers they are every way superior in manner and behaviour, and while the general quality of their work is better, the quantity performed is in the ratio favourable to the former of 3 to 4.

The idea of a cottar—with his family in "bondage" as it is styled—being very miserable, is a picture much overdrawn by those who fancy rather than actually know his position. With a comfortable cottage, garden, and potatoes, his milk and butter supplied at wholesale price at the steading, his coals led free,

and plenty of fresh and pure water, as well as the other income gathered from the annexed detail, he is far from miserable. On the contrary, he is much removed above the corresponding grade in towns, and often is little worse off than his master, infinitely better than a small farmer struggling with a dear holding.

The man himself,	£42	0	0
House,	4	0	0
Potatoes,	1	0	0
Boy kept the year round,	18	5	0
Two workers in harvest,	6	0	0
Do. for 187 dry days (average),	23	7	6
	£94	12	6

The writer has had in his employment a family of which the approximate earnings were as follows, viz. :—

Father of the family for drainage, &c., during 48 weeks, an average of £1 per week,	£48	0	0
In harvest (without meat),	6	10	0
Son who wrought horses,	45	0	0
Three workers (two girls and one boy) in harvest,	8	10	0
Do. during 187 days at 1s. 3d.,	34	18	3
House and potatoes,	5	0	0
	£147	18	0

A family of different composition, although with only one man, was not far behind.

Man himself,	£45	0	0
Boy, year round at 1s. 3d. per day,	19	11	3
Mother, one girl, and one boy in harvest,	9	0	0
187 days of each at 1s. 3d.,	34	18	3
House and potatoes,	5	0	0
	£113	9	6

The want of sufficient education for the agricultural labourer has always been a drawback to both him and his employer; but with a national system this difficulty will be in a great measure obviated for the next generation.

As to technical education, a little elementary physiology and mechanics would be of considerable benefit to the agricultural labourer. With a knowledge of the principles of mechanics he would be more capable of preserving the machinery under his care, and, as a consequence, would execute a greater quantity and better quality of work. The opinion of the writer, however,

is against extending compulsion from the age of 13 to 14, as by the Act of 1878. The power of school boards to disperse a school for six weeks other than the usual holidays, on account of useful labour, is hardly the benefit intended, and rather than take advantage of this power, a discretionary indulgence is granted in individual cases to suit the view of the employers. It is considered that a deal of useful work can be done by a youngster during four months of the year without much interference with an elementary education. But, on the other hand, employers and parents cannot be too strict in seeing that nothing but illness or useful work is an excuse during the school age, so that they may afterwards be better able to become useful citizens.

The following fairly represents the labour bill on a farm of 500 acres of arable land, managed on the five course rotation, and employing nine horses:*—

Foreman,	£60	0	0
Two Ploughmen,	90	0	0
Shepherd,	50	0	0
Cattleman,	40	0	0
Houses, &c.,	25	0	0
Two lads, constantly employed,	39	0	0
Eight workers in harvest, from cottages,	24	0	0
Do. at other times, 187 days each, at 1s. 3d. per day,	93	10	0
Additional harvest labour.—Three at £6. 10s.	19	10	0
Do. do. Three at £5,	15	0	0
	£456	0	0
If potatoes are extensively grown, there might be required two at 3s. per day, and four at 1s. 6d., for 20 days,	12	0	0
	£467	0	0

The labour here represented will at almost all times fully overtake that required on the holding, and the writer has not yet come in contact with any other system which will compare with the one advocated for cheapness, efficiency, and dependence upon it in time of need. The comfort of the class whose interest is most at stake is anything but despicable, and comes well up to the description perpetuated by Burns in the "Cottar's Saturday Night."

There are, however, some details requiring a little explanation. The foreman would not work when engaged in oversight; but when the days' workers were either not employed or engaged in piecework—suitable in a greater degree to winter work—he could

* This is considered by the readers too small a labour bill for an ordinary farm of 500 acres under the five shift rotation, though with a *light soil*, and under very favourable conditions, it might be possible.—*Editor.*

keep odds and ends in order. The cattleman would in spring turn in to a pair of horses liberated from the three-yoke of the double-furrows. The lads would cart grain and turnips in winter, harrow or set potatoes in spring, hoe and weed in summer, and lift and cart in harvest, and in potatoe-lifting cart or lift a drill as required.

On a dairy farm a dairyman will replace the shepherd, but, of course, with a house near the steading, and the cattleman would by turns undertake the shepherding and odd work generally. But, as dairymen usually are chary of allowing their families to work in the fields, and as they are within the highest department of skilled farm labour, at least £35 may be added to the labour bill with dairy economy. It is considered that a farm under 150 acres is not the kind embraced in the report, for there the press of work is usually nominal; but still there are features connected with the labour of a small holding which—more especially when a cry is raised for a peasantry owning and farming small holdings—demand a passing notice. The work is, as a rule, equally well, sometimes better, executed, and even in better season, by the family of the farmer; but it cannot by any means be reckoned a cheap source of labour. If it is cheaper, then it would require to be proved that it takes less to dress and provide pocket-money for the farmer's family than would pay hired servants to replace them—a proposition which cannot be established. In the way of food there can be no preference—that would admit a worse position for the family of a small farmer than the servants of larger ones. But, on the other hand, it is well established that *grande* rather than *petite culture* is the powerful means of production, and with the great proportion of our population which are engaged in manufactures and commerce the mind will more readily drift in the direction of large and cheap production than of greater comfort to a section of those engaged in it.

But improvements can also still be engrafted on the best of our systems of labour on the farm, with a view of being better able to cope with the press in busy seasons. There is no time in which the press is greater, or the rate of wages higher, than in harvest, although the work done per labourer is neither harder nor of longer daily hours than at some other times of the year. Partly from an idea clothed in superstition, partly from the hard labour of the days of the reaping hook, harvest labour is unduly elevated in the scale of wages.

To alter this almost stupid custom employers must make a decided effort, and there is no more effectual method than erecting sheds for the grain crops, and thus getting rid of the skilled harvest hands. These could be replaced by a cheaper unskilled set, and the cost of the sheds is well met by the saving of the extra labour and waste which stacking involves. The demand

lessened, there is also a deal to be done in arranging the work, so as to obviate a press at particular times, and the scheme in this direction is as necessary and as powerful as in furnishing the requisite supply. The regulation of the work, so that as far as possible the ordinary hands can, without any outside help, overtake it, is a part of the management on which every prudent farmer will exercise considerable care and thought. And to explain this more fully a brief sketch of the year's labour on a 500 acre farm—the size already treated—will be submitted. Beginning this sketch with winter, the area for potatoes is alloted, and the summer manure is carted out and immediately spread. This process is continued at the slacker seasons, and in frosty weather, until the whole is covered. If it is then considered that there will be no difficulty in spring work, the turnip break of stubble is left and manured in spring, either with remaining dung or artificial manures. The ploughing of the unmanured portion is proceeded with, and a good deep furrow turned on to its back best saves spring labour. The manured portion is allowed to stand for the soluble constituents to wash into the surface soil, and ploughing is deferred until February or March. By this means the crop of annual weeds is small, and much less horse and manual labour in spring and summer will suffice. The crop of potatoes is increased by this method rather than manuring in spring, but the same cannot be said of turnips, although both crops are sounder. Lea ploughing next proceeds during wet winter weather, and in dry snatches, or in the few good days which generally precede frost, all hands must be put to storing turnips. At suitable intervals the potato crop of the previous year must be sent to market, so as not to interfere with the busier spring months. With the fourth pair of horses—three are engaged with two double-furrow ploughs—the foreman may expedite ploughing by opening and finishing ridges, and ploughing headlands and awkward corners, of which there are always a few, with a single-furrow plough. In February the remaining stubble is turned over, and the turnip and potato land, except some which may have been sown in winter wheat, is either ploughed or grubbed, the latter growing in favour, for the seed-bed in spring. Early potatoes go in early in March, with dry weather if possible, and the sowing of oats proceed about the end, and are all in by 10th of April, with the exception perhaps of a plot on which the sheep are still kept. Late potatoes—the seed previously prepared—are now got in, and no delay occurs if the proper set of hands are put to the ploughs. The preparing of turnip land is going on, and by the beginning of May, at farthest the 15th, swedes are sown. This operation usually finishes about the middle of June, and as putting in with artificial manures proceeds, one plough may, by extending the

marker to a drill and a half, and in the scratch of which the manure is sown, do the work of two, and allow the others to be engaged in cleaning or other work. The input is not long finished before the first breadth will have got the rough leaf, and hoeing is begun as soon as practicable, so as to keep in advance rather than allow a loss of growth and increased cost of the work. Where potatoes up to the half of the break are grown, the ordinary hands will suffice, for the weeding can be a little postponed. With good management, continual earthings, saddle harrowings, and furrow grubbings, very little weeding is needed, and even that can be accomplished on days too damp for turnip work. But where the whole break is in turnips—the only suitable green crop on some soils—it is readily seen that the ordinary hands cannot cope with the hoeing and weeding of 100 acres of turnips. The first hoeing must be through in twenty-eight days,* and not more than $2\frac{1}{2}$ acres with hoes, or $3\frac{1}{4}$ with the hands, can be accomplished in a day, so that aid from some other source becomes imperative. Towns, villages, reformatories, and industrial schools are then drawn on as a supplement; but a few keep house servants, women or boys, for the summer season. When the green crop has received its last turn, and the weeds have been mown on the pastures, usually on wet days, meadow hay is cut and *won*, and there is little interval between it and harvest. The cutting of rye grass hay is not, with few hands and a large breadth of green crop, a desirable practice, for with the two on hand at one time some of the operations must be neglected, while grazing in the end is often as profitable. If no hay is cut, then there will be a considerable interval between finishing green crop and harvest, and during it roads are repaired, ditches cleaned, stackyard put in order, and a great many such like operations, only meddled with in such times, are performed. It is needless almost to say that if water-power is not available, steam is the most suitable for thrashing, grinding, &c., and the steading should be so constructed that there is no loss of labour in moving from one part to another, or for want of good machinery. The carts should get into the barn by a large door, so as to empty the cart by tipping it, and, without being out of doors, the fodder should be conveyed only a short distance to the cattle and horses. The harvest now arrived, three reapers—self-delivery ones—will be required, two for constant use, the third to replace one requiring a temporary repair. The hands allowed will finish harvest in a month of fair weather, and if sheds are erected, a deal can be saved by dispensing with skilled hands. Potato raising follows, and if half the green crop breadth is grown, supplementary

* The general belief is that more work can be done with hoes than by hand.—*Editor.*

labour is as necessary as in harvest. A digger is one of the implements of such a farm.

The farmer, more than any employer of labour, is excluded from the advantages of division, for, when the weather suits, all who can bear a hand are in requisition at the job requiring to be put out of danger. As a rule, however, it is unwise to keep workers at what they are awkward, and, if possible, they should not be moved in the middle of a half day. The labour of shifting is as severe as actual work, and moreover is entirely unproductive. It is a good move in both master and servant to renew engagements. The men who stay longest in one employment are the best of servants, and the master who does not take a greater interest in an old servant must not be altogether human.

If there is anything which has detracted from the independence and self-reliance of the working man, it is the Poor Laws. They may be termed a necessary evil, but there are means of giving the men a better spirit, and these means have not been by the privileged higher classes patronised and supported as they ought. Friendly societies for the sick and those off work through no fault of their own, deserve every encouragement. It has been said, and truly, that a very small weekly or monthly payment by those earning wages would save a poor-rate altogether, but it is only by example and kindly interest that such can be advanced, not by compulsion or an interference with the liberty of the subject. The saving's banks have been productive of much good, and precept should run a deal in this direction.

A VISIT TO ROTHAMSTED.

By Dr Andrew P. Aitken, Chemist to the Society.

Rothamsted, whose name is now familiar among agriculturists as a household word, is a fine old estate in the neighbourhood of St Albans, Herts. It is about 25 miles distant from London, and is reached in about an hour by the Midland Railway. The station is Harpenden, close by the pretty little village of that name, and from it may be seen the gate of Rothamsted, and the large handsome building which is the chemical laboratory. About half a mile distant is the famous experimental station. There is certainly no spot of ground in all England so full of interest and instruction to agriculturists, and so well deserving of a visit by all who are interested in the history and progress of scientific agriculture, as the few acres contained by this experimental farm. The proprietor of Rothamsted is Dr J. B. Lawes, who inherited it in the year 1834, and who, in 1843, founded the experimental station which he has maintained ever since. His attention had early been directed to the valuable researches of De Saussure on the conditions of plant life, and he began experimenting with dissolved phosphates and other manures. The results were so interesting that, in 1843, he commenced a systematic series of field experiments, and secured the co-operation of a skilled chemist,—Dr J. H. Gilbert, who has ever since been associated with Dr Lawes in all his work. Under his direction a barn was converted into a chemical laboratory, and in it the ever-increasing chemical work of the station was conducted for about twelve years. The importance of the work carried on during these years was widely appreciated, and, in 1855, a subscription was raised among a large number of agriculturists, wherewith a large laboratory was built, and presented to Dr Lawes in recognition of the services he had rendered to agriculture. Since then the work in the laboratory has progressed uninterruptedly, and has been continually increasing. The staff of workers now numbers twelve or more. Of these three are skilled chemists, who perform minute analysis, and carry on chemical investigations of all kinds; three are general assistants, who superintend the out-door work of the field experiments, the making and applying of manures, the weighing and measuring of crops, and who preserve samples, and also partially analyse the various products of the farm. Already 25,000 bottles are stored and arranged on the shelves of the laboratory, containing samples of the various vegetable and animal products, ashes, soils, &c., connected with the experiments. There is also a botanist on the staff, who has a varying number of assistants under him. Three computers are constantly

engaged calculating, tabulating, recording, and transcribing the results of the investigations. The amount of such work in connection with field experiments, however simple, is very great, and the extraordinary manuscript library in connection with the Rothamsted experiments is a marvel of patient labour. It is so complete that there seems scarcely any question that can be asked in connection with any series of experiments which cannot be immediately answered by reference to a statistical table drawn up as if for its special elucidation. In addition to the staff already noticed, the assistance of scientific chemists, both at home and abroad, is constantly being obtained for ash analysis, and also for the investigation of questions of scientific interest which arise from time to time; and in and out of the laboratory there is always employed a varying staff of general servants. This is a large establishment, maintained at a cost of about £4000 per annum.

On the experimental farm, although many new investigations have been taken up from time to time, yet the old experiments laid down in 1843 have not been abandoned. Accordingly, a visitor at Rothamsted will see in progress experiments which are now nearly forty years old. Among these there may be some which might now be considered superannuated. That is a very difficult matter to decide, and one which may well be left to the discretion of those who have planned them,—who have watched their progress, and are intimately acquainted with their history. A plot which has been similarly treated annually for forty years, and whose produce has been carefully recorded, is pedigree land constituting a basis invaluable for experiment, but, like an old tree, if once destroyed it cannot be restored. That such land should be allowed to fall out of cultivation, or to be carelessly cultivated, would be more than a national loss; but fortunately it is secure against any such misfortune, for the founder, with praiseworthy liberality, has provided for its preservation by setting apart £100,000 to maintain it in all time as an experimental station for the advancement of the science of agriculture.

The work carried on at Rothamsted may be classed under three heads:—

1. Field experiments for the investigation of various questions regarding vegetation and agriculture.
2. Feeding experiments with animals.
3. Scientific investigations in the laboratory.

The general scope and plan of the field experiments is said to be, "To grow some of the most important crops of rotation, each separately, year after year for many years in succession on the same land, without manure, with farmyard manure, and with a great variety of chemical manures,—the same description of

manure being, as a rule, applied year after year on the same plot." Experiments on an actual course of rotation, with different manures, have also been made.

The following table shows the cropping, the breadth under each experiment, and the duration of each:—

Crop.	Duration (Years).	Acres.	No. of Plots.
Wheat, . . .	36	13	35
Barley, . . .	28	$4\frac{1}{5}$	23
Oats, ...	11 (1 year fallow),	$\frac{3}{4}$	6
Wheat and fallow alternately, . .	28	1	2
Beans, ...	33 (1 year wheat, 5 years fallow),	$1\frac{1}{4}$	10
Beans, . . .	28	1	5
Beans and wheat alternately, . . .	29	1	10
Clover, alternating with fallow or corn crop, . . .	29	3	18
Turnips, . . .	29 (3 years barley),	8	40
Sugar Beet, . .	5	8	40
Mangel Wurzel, . .	3	8	40
Potatoes, . . .	3	2	10
Rotation, . . .	32	$2\frac{1}{2}$	12
Permanent Meadow, .	24	7	20

Samples from all these plots are taken annually, and are weighed, dried, and preserved in the laboratory. Duplicate samples are dried at 100° C. to determine their dry matter, and then they are burnt on platinum dishes in muffle furnaces, and their ash preserved for future analysis.

In many cases the amount of nitrogen is immediately determined, in others the sugar is estimated, and other estimations made, according to the kind of crop and the aim of the experiment. The various soils are also being frequently analysed; and, in the able hands of Mr R. Warrington, an extensive investigation regarding the nitrogen in various soils is being systematically carried out.

The rainfall has been accurately measured during twenty-five years in an ordinary rain guage, and also in a larger guage $\frac{1}{1000}$th of an acre in area.

Besides these regular observations and investigations, special subjects have been made matters of research from time to time, —such as the transpiration of water by plants, the botanical relations of plants under various systems of treatment, the assimilation of nitrogen by plants, &c.

The experiments with animals, once conducted on a great scale at Rothamsted, have been discontinued or nearly so. The objects of these important experiments were to determine the relation between the character and amount of food consumed

and the gain in liveweight; also the special uses made of the food in the animal body; and an inquiry into the proximate and ultimate composition of animals and their various parts at different stages of fattening; the relation between food and manure, and other points of interest, such as the sources, in food, of the fat produced in animals, &c.

The samples and specimens in connection with these investigations form an interesting collection in the laboratory museum.

As to the other miscellaneous investigations which have been and are being carried on, reference must be made to the published accounts of them which are to be found mostly in the pages of the *Journal of the Royal Agricultural Society of England*.

In a short notice such as this it is impossible to do more than draw attention to the general results of a few of the more important field investigations,—such as might be learned by any one on being shown over the experiments by the investigators, who are ever ready to point out and explain any or all of their experiments to those who are wise enough to go and see them.

The date of our visit to Rothamsted was 3d July, but owing to the extraordinarily late season, the grass was still standing, and this was so far fortunate, as the experiments with different manures on permanent meadow land were perhaps the most remarkable and interesting sights of the day. In the absence of Dr Lawes, who was engaged accompanying a large deputation of foreigners over the Royal Agricultural Society's Experimental Farm at Woburn, Dr Gilbert conducted us over the ground, assisted by Mr Craik, who represented his relative Dr Lawes. To both these gentlemen our hearty thanks are due for the very cordial manner in which they received us, and spent the entire day in exhibiting, and describing to us, all the experiments.

To begin with the grass experiments on permanent meadow land. They are conducted on the old park, which has been under grass from time unknown,—perhaps for centuries, and has had no seed sown on it for at least forty years. The experiments here were commenced in 1856, at which time the herbage over the whole breadth was perfectly uniform in character.

The object the experimenters had in view was to determine the effects produced by various systems of manuring, first upon the quantity of the crop of hay, and secondly on its quality. In this, as in almost all other cases, the same manures were applied, year after year, to the same plots, except where otherwise indicated.

The effect of the manures on the amounts of crop will be seen from the following table:—

THE PARK.—EXPERIMENTS WITH DIFFERENT MANURES ON PERMANENT MEADOW LAND.

No. of Plot.	Date of Experiment.	No. of Years.	Farm-yard Manure.	Ammonia Salts.	Nitrate of Soda.	Super-phosphate.	Sulphate of Potash.	Sulphate of Soda.	Sulphate of Magnesia.	Average Produce.	Produce per Acre, weighed as Hay.*		
											Per annum, 10 years, 1856-65.	Per annum, 10 years, 1866-75.	Per annum, 20 years, 1856-75.
			tons.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	cwts.	cwts.	cwts.	cwts.
1	*a* 1856-63,	8	14	...	...	...	...	...	...	49⅕	48⅔	37¾	43
	b 1864 and since,	...	...	200	...	...	...	...	...	38⅘			
2	*a* 1856-63,	8	14	...	...	...	...	...	...	42⅕	41⅘	32	36⅞
	b 1864 and since,	...	...	...	...	...	...	...	...	32⅘			
3	Unmanured,	...	...	...	...	...	...	...	...	...	22½	20	21¼
4	*a*	...	...	...	...	400	...	...	...	...	23¼	21¼	22¼
	b	...	...	400	...	400	...	...	...	...	33⅞	30½	32¼
5	... ...	...	...	400	...	...	...	...	...	...	30½	22	26¼
6	*a* 1856-68,	13	...	400	...	...	...	...	...	30⅗	31⅝	30¼	30¾
	b 1869 and since,	...	...	...	...	400	300	100	100	31¼			
7	... ...	...	...	...	...	400	300	100	100	...	33⅞	36¾	35¼
8	*a* 1856-61,	...	...	...	...	400	300	200	100	36	33⅘	26¼	30⅕
	b 1862 and since,	...	...	...	...	400	...	250	100	27½			
9	... ...	...	...	400	...	400	300	100	100	...	53⅘	48½	51
10	*a*	...	...	400	...	400	300	200	100	55½	52¾	39⅖	46⅛
	b	...	...	400	...	400	...	250	100	42¼			
11	... ...	...	...	800	...	400	300	100	100	...	61¾	53⅖	57⅘
12	Unmanured,	...	...	...	...	...	...	...	...	...	25	22⅞	24
14	1858,	...	...	...	550	400	300	100	100	...	53⅕	60½	57
15	*a* 1858-75,	...	...	...	550	...	...	...	...	...	36⅕	35	35⅗
	b 1876 and since,	...	...	...	...	400	300	100	100	33½	...	...	...
16	1858,	...	...	...	275	400	300	100	100	...	45¼	47⅘	46½
17	1858,	...	...	...	275	...	...	...	...	...	34¼	33½	33⅞
19	1872,	...	...	...	275	400	290	...	...	38⅖	...	...	...

* The weights given refer to the amount of hay produced by the first cutting only.

† 550 lbs. nitrate of soda are equivalent to 400 lbs. ammonia salts. The ammonia salts are made of equal parts of sulphate and muriate of ammonia

That considerable differences would be observed in the quantity of the crop was a result which their experience with the same manures upon other crops led them confidently to expect, but that the whole character of the crop should be wonderfully altered was certainly a result which even the most sanguine could scarcely have anticipated. The soil of the park is a heavy loam with a red clayey subsoil resting on chalk, having a good natural drainage and a very uniform character and situation.

It will be seen from an examination of the above table that the weight of hay on the unmanured plots (3 and 12) averaged 23 cwt. per acre; that the addition of 3½ cwt. superphosphate (4 *a*) had no effect in increasing the amount of the crop, a circumstance which may seem surprising to many who find great advantage from the use of superphosphate upon grass lands; but it must be remembered that the soil here has not been impoverished by the feeding of young cattle or of milk cows, both of which abstract from the soil a large amount of phosphoric acid. When to the superphosphate was added ammonia salts (4 *b*), the crop was increased to 33 cwt., showing that the nitrogen was deficient, and that that deficiency caused the superphosphate to remain inactive. When to these were added mineral manures (9), the crop was immediately increased to upwards of 50 cwt. per acre. Of the mineral manures, the sulphate of potash was the most important, for when it was omitted (10 *b* and 8 *b*) the crop diminished about 10 cwt.; the increased amount of sulphate of soda not being competent to compensate for the want of that constituent. When, in addition to the mixed mineral manures, a double application of ammonia salts, 800 lbs. per acre, was given (11), a still further increase was obtained, amounting during the first ten years to upwards of 60 cwt. per acre, but this increase was not maintained during the second ten years, showing that the quantity of mineral manures annually applied was relatively deficient, and that a large part of the increase in the first decade was obtained at the expense of the mineral wealth already in the soil. If, then, we limit our attention to the three important constituents, nitrogen, phosphoric acid, and potash, we find that the supply of nitrogen naturally in the soil was deficient, and capable of enabling only a limited amount of the phosphoric acid and potash therein to be assimilated by the crop. The addition of a nitrogenous manure (5) went far to rectify that deficiency, but still did not produce a full crop, the phosphoric acid and potash being now deficient. When the phosphoric acid was added (4 *b*) a further increase was obtained, but it was only when all three were applied (9) that a full crop was the result. The smallness of crop on plot 7 was due to the want of nitrogen, that on plot 4 *b* was due to the want of potash, and had there been a plot on which phosphates had been omitted

but the other two supplied, no doubt a similar deficiency of crop would have been the result. This shows very conclusively that a deficiency in any one constituent of a fertile soil cannot be compensated by an excess of the others. It requires some care on the part of the farmer to determine what are the proportions of these constituents required for each particular soil, in order to produce a full crop, and this he can learn by experimenting in the manner above described. The proportions on plot 9 are not supposed to be the best possible, though they seem to have come very near it. If there is any deficiency, it is in the nitrogen, as shown by the increase on plot 11; an increase, however, which was not great, and quite disproportionate to the large addition of ammonia salts which produced it. A much smaller increase of ammonia salts would probably have been quite as effective. The limit of profitable manuring has here been passed. The point at which profitable manuring ceases is when the crop is as heavy as will stand against wind and weather, and when the cost of additional manuring is as great as the value of the additional crop.

There are many other incidental lessons to be learned from the above experiments. Plot 1 shows that farmyard manure is an excellent application for grass, and that it is more permanent in its effect than other manures. The 200 lbs. ammonia salts given annually to (1 *b*) in the second decade are intended to exhaust the residues of mineral wealth left by the farmyard manure during the first decade, and it is shown that this exhaustion is progressing at the rate of about 1 cwt. per annum. A converse experiment is going on on plot 6, where ammonia salts, which were applied for thirteen years, have been discontinued, and minerals are now being given to use up any residual nitrogen which may be lying there. It will be seen that that amount is exceedingly small, the average annual increase during seven years being only about $\frac{3}{4}$ cwt. Another experiment of a similar kind has recently been started on plot 15. Here, instead of ammonia salts, an equivalent amount of nitrate of soda has been applied, but as yet, of course, it is not apparent whether the residual nitrogen, resulting from an application of nitrate of soda, is greater or less than that derived from its equivalent of ammonia salts. Plot 15 *a*, however, compares favourably with plot 6 *a*, and would seem to show that nitrate of soda is a better manure for grass than an equivalent amount of ammonia salts, and this is a result which is supported by general experience. The ordinary practice of top dressing grass with nitrate of soda in preference to ammonia salts is thus shown to be founded on the superior efficacy of the former. The reason of the superiority of nitrates over other forms of nitrogenous manures has also been made a subject of investigation at Rothamsted. It has been

observed that nitrates find their way more rapidly through the soil, and come sooner in contact with the rootlets of deep rooting plants such as grasses, and also that they effect a marked change in the character of the lower soil and subsoil, rendering it more porous and pulverulent. But whether ammonia salts or nitrate of soda is used it seems quite evident that their effect is not very lasting, and they cannot be relied upon to have much influence on any crop save the one to which they are immediately applied.

A very important and still more interesting part of the investigation remains to be considered. The differences in the bulk of crop obtained by the various modes of treatment, though very marked, were as nothing compared with the extraordinary diversity in the character of the crops upon the several plots. So striking were these that it seemed almost incredible that they were due to the sole effect of various manuring, and that no seed of any kind had been deliberately sown on the original pasture. Indeed the appearances of some of the plots were such as to make it seem a matter of surprise that they were grass experiments at all, and not unnaturally evoked the remark from a lady, who recently visited the station, that she could not have believed it possible that science should have been capable of spoiling so much good grass. On one plot might be seen a rank luxuriant growth of cock's foot grass in full seed, on another, soft silky fescues predominated, on another, meadow grasses, &c. On some plots there was a rich crop of clover and vetches, and on others not a vestige of a leguminous plant was to be seen. One plot seemed devoted to the cultivation of the sorrel dock, and others to umbelliferous plants of various kinds. This divergence of character from the natural growth of the original meadow-land has been growing more and more manifest every year, and was early noted by the experimenters who took so much interest in the matter as to cause a careful botanical separation to be made of the various species found on each plot. This has been done periodically with great care and trouble for many years, and the results are exhibited upon an elaborate chart, showing "the domination of one order of plants over those of others in the mixed herbage of grass land under the influence of different manures, each applied year after year." A large show case is also exhibited in the laboratory, showing the actual dried herbage derived from a fair sample of each plot, and these have been assorted, after careful separation, into their various botanical genera and species, and so arranged as to show the precise character of each plot at a glance. A few figures taken roughly from a chart in the laboratory will serve to illustrate the differences between a few of the plots. The figures represent the averages of determinations taken at four different times—1862, 1867, 1872, and 1877.

PREVALENCE OF VARIOUS SPECIES OF VARIOUS ORDERS FOUND ON PERMANENT MEADOW LAND UNDER DIFFERENT MANURIAL TREATMENT.

		Plot 3	Plot 5	Plot 7	Plot 9	Plot 11	Plot 14
Total No. of Species (average of four investigations).		49	34	43	29	19	29
Consisting of :—							
Gramineæ,	per cent.	64·8	82·7	60·0	86·3	93·8	88·2
Leguminosæ,	,,	7·7	0·3	22·7	0·2	...	0·7
Umbelliferæ,	,,	3·8	2·4	4·4	3·7	1·0	3·5
Compositæ,	,,	3·6	2·2	3·4	1·6	0·4	0·7
Ranunculaceæ,	,,	3·3	0·2	0·7	0·1	...	0·6
Other Species,	,,	16·7	12·2	8·6	8·2	4·8	6·2

It will be seen that in the unmanured plot, No. 3, the number of species growing averages 49. This is a large number, but it may be considered fairly to represent the normal growth on old pasture land. The other plots all contain a smaller number of species, shewing that the effect of manuring in any way is to diminish the number of species grown on grass land, and the number diminishes in proportion as the amount of the manure increases. On plot 11, which received the heaviest manuring, the total number of species is reduced to 19. The manuring on plot 11 (see p. 242) is a very large application of ammonia salts (800 lbs. per acre), and the effect of this has been to choke out almost every species of plant except the grasses, the gramineous plants here amounting to about 94 per cent. The orders which have suffered most by nitrogenous manuring are seen to be the leguminosæ and ranunculaceæ. On the other hand, on plot 7, which received no nitrogenous manure, but a liberal supply of mineral manure, a converse relation is observed, the leguminous plants are here at their maximum and the grasses at their minimum. That nitrogenous manures discourage the growth of clover is pretty well known, but the extent to which the mixed mineral manures favour the development of this important constituent of pasture land is well brought out in this experiment, and deserves the careful attention of agriculturists. A comparison of plot 7 with plot 3 shews that the application of mineral manures has had the effect of increasing the leguminous plants threefold.

It would seem then that by judicious manuring alone the herbage of pasture land is, within certain limits, capable of being controlled. The numbers on the above table, though they shew very clearly marked differences in the selected plots, fail entirely to convey to the reader any idea of the very striking diversity of appearance presented by the various plots at the time of our visit.

The unmanured plot No. 3 was a gay pasture, rich in colour and variety of growth. There was no rankness or coarseness to be seen on it. Many grasses were blended together and seeding freely. The most abundant of these were the fescues, after them the oat grasses, rye grass and bent grass, and next the Yorkshire fog and the two meadow grasses. Red clover was plentiful, and in patches here and there were seen the white clover and the yellow blooms of the bird's foot trefoil. The little black heads of the plantain were thickly strewn over the grass, and yellow buttercups shone out in abundance; daisies and dandelions also contributed their white and gold, and above all floated like a thin lace the small white umbellate blooms of the caraway.

When to this natural meadow a dressing of ammonia salts was applied, the gay colours disappeared. A strong green grassy herbage prevailed, interspersed with only a very few flowers. Even the grasses themselves flowered little, but seemed to spend their strength in the production of an abundant growth of leaf. Moreover, the leafier grasses predominated, such as the hard fescue, the downy oat grass, and especially the bent grass and Yorkshire fog. Clover and everything leguminous had disappeared, but in their place came up in abundance the rank leaf and tall shaggy flowering spike of the sorrel dock, the soft leaves and white flowers of the milfoil, and a slight sprinkling of caraway, woodrush, and other miscellaneous herbage.

Very different was the appearance of plot 7, which had received mineral manures alone. It was of a light green colour, and consisted of a great variety of grasses, many of which were in flower, as in the unmanured plot, and prominent among them was the rough meadow grass (*Poa trivialis*). But the great distinguishing characteristic of this plot was the very luxuriant undergrowth of clovers, vetchings, trefoils, and other leguminous plants, whose abundance rendered the grass an object of secondary importance.

A striking contrast to all these was exhibited by plots 9 and 11, which had received a liberal dressing of both ammoniacal and mineral manures. There the crop was enormous, rank and coarse in its growth, and of a dark green colour. Nothing but grasses were to be seen, and prominent above all was the tall rough cock's foot grass, whose hoary rugged panicles crowned all the other herbage, and contrasted strangely with the green lush leaves below. Other good grasses were also there in considerable quantity, notably the oat grass, the soft meadow grass, and the perennial rye grass. Of clover or other leguminous plant not a trace could be seen, and of miscellaneous herbage, although here and there a dock flower or umbelliferous plant was noticed,

yet their contribution to the general mass of vegetation was of no account.

On plot 15, where nitrate of soda alone had been given, the appearance of the crop somewhat resembled plot 5, but here the foxtail grass (*Alopecurus pratensis*), which formed no feature in other plots, became the predominating grass. As in the case of the other plots which had received nitrogenous manures, the clovers and other leguminous plants had disappeared, but unlike the ammonia plots a miscellaneous herbage of considerable variety was seen flourishing on this plot.

When in addition to nitrate of soda the mixed mineral manure was added, the whole character of the herbage was changed. In the strong rough superabundant crops the foxtail grass was no longer visible, but fescues, poas, oat grasses, and bent grasses competed for the mastery. Leguminous plants made their appearance only to a very limited extent, but the miscellaneous herbage was considerable, and consisted mostly of dock sorrel, ranunculus and a few umbelliferous plants.

These experiments show clearly that a very intimate relation subsists between the different grasses and the various forms of fertilizing agents, and that it is possible by means of the latter to exercise some kind of control over the character and relative amounts of the grasses grown on meadow land. They shew that some forms of manure encourage the growth of the sweeter grasses and other plants that are valued as hay, and that others favour the development of the coarser and more rapid growing grasses, which in their young state are held in esteem as green fodder.

We come next to consider the experiments with barley which have been going on on Hoos Field for about thirty years. The system of manuring resembles in many respects that adopted for the grass experiments. The primary object of these experiments seems to have been to determine the extent to which nitrogenous manures are necessary for the growth of white crops. At the time of their commencement the use of ammonia salts or nitrates as manure was very imperfectly understood, and it is undoubted that the rapid increase in the popularity and intelligent use of this most important class of manure were in great measure due to the precise results obtained from the experiments conducted at Rothamsted.

The soil of Hoos Field resembles that of the Park. It has no artificial drainage. It is divided into plots, each about a fifth of an acre in extent.

The amount of corn and straw, and the system of manuring during the twenty-four years beginning in 1852, will be seen from the subjoined table:—

Hoos Field.—Experiments on Barley Grown Continuously.

	Manures per Acre per Annum.						Produce per Acre.					
							Average Dressed Corn.			Average Straw.		
	Ammonia Salts.	Nitrate of Soda.	Rape Cake.	Super-phosphate.	Mixed Minerals.	Farmyard Manure.	12 years, 1852–63.	12 years, 1864–75.	24 years, 1852–75.	12 years, 1852–63.	12 years, 1864–75.	24 years, 1852–75.
	lbs.	lbs.	lbs.	lbs.	lbs.	tons.	bushels.	bushels.	bushels.	cwts.	cwts.	cwts.
1 O	Unma-	nured	contin-	uously	...	...	21 7/8	15 7/8	18 7/8	12 7/8	9 1/4	11
2 O	...	...	...	400	...	...	27 7/8	20 3/4	24 1/4	14 3/4	10 1/4	12 3/4
3 O	...	...	...	...	400	...	24 1/8	17 3/4	21 1/8	13 1/8	9 1/4	11 3/4
4 O	...	...	...	400	400	...	30 3/4	21 1/2	25 7/8	15 7/8	10 7/8	13 3/4
1 A	200	...	...	...	...	...	34 1/4	29	31 5/8	19 7/8	15 3/4	17 7/8
2 A	200	...	...	400	...	...	47 3/8	45 3/8	46 3/8	28 3/8	24 1/8	26 1/4
3 A	200	...	...	...	400	...	36 1/4	32 1/2	34 3/8	22 3/8	17 3/4	20
4 A	200	...	...	400	400	...	47	44	45 1/2	29 1/2	26 1/8	27 3/4
1 AA	...	275	...	...	...	...	39 1/2	32 1/4	36	23 7/8	18 3/4	21 1/8
2 AA	...	275	...	400	...	...	50 1/4	47 1/4	48 5/8	31 7/8	27 1/4	29 1/2
3 AA	...	275	...	...	400	...	39 3/4	32 7/8	36 3/8	25 7/8	20	23
4 AA	...	275	...	400	400	...	50 1/2	46 3/8	48 1/8	34 1/2	28	31 1/4
1 C	...	...	1000	...	...	...	47	42	44 1/2	29	22 3/4	25 7/8
2 C	...	...	1000	400	...	...	48 1/4	44 1/4	46 1/4	30 1/8	24	27 1/4
3 C	...	...	1000	...	400	...	44 1/4	41 1/4	42 7/8	28 1/2	23	26
4 C	...	...	1000	400	400	...	47 7/8	45 3/8	46 3/4	31	25 3/4	28 1/2
1 N	...	275	...	...	...	...	38 3/4	35 5/8	37	24 1/8	20 7/8	22 1/2
2 a N	...	550	...	...	...	...	43 1/8	39 1/8	41	27 3/4	23	25 3/8
2 b N	...	275	...	...	...	...						
7 (1) a	...	...	...	...	...	14	...	aver. of 6 yrs. 38 5/8	aver. of 20 yrs. 48 1/4	28 1/4	...	...
7 (1) b	...	...	...	...	...	...	...	...	...	...	...	...
7 (2)	...	...	...	...	...	14	46 5/8	50 3/4	48 3/4	27 7/8	29 5/8	28 3/4

Another important purpose served by these long continued experiments, and one which is proving of good service at this time, is the assurance they give that continuous white crops may be raised successfully, and that whatever may have been the necessity for restrictions in cropping under the old system of agriculture, no such necessity exists under the modern system of intensive farming, but that complete liberty of cropping may be accorded to good farmers without risk of detriment to the fertility of the soil.

The paramount importance of nitrogenous manures for the production of a full crop of this cereal is evident from a comparison of the four plots in series O, which received no nitrogenous manures with those in the next three series which received ammonia salts, nitrate of soda, and rape cake respectively. Roughly speaking the crop has been doubled both in grain and straw by the application of nitrogenous manures, and this is especially noticeable in the average produce of the second twelve years to which attention deserves to be specially directed, inasmuch as any irregularities due to former manuring are eliminated in that stage of the experiment.

A comparison of the four plots of each series yields some interesting information. Thus in series O the unmanured plot, No 1, is seen to be rapidly losing its fertility. On plot 2 the addition of superphosphate increased the crop during the first twelve years in making good the annual drain of phosphoric acid and in making up for a deficiency of it in the soil; but the exhaustion is still very rapid, and it is now reduced to a lower level than the original unmanured soil, but this is certainly not due to any want of phosphoric acid, nor is it due to the want of potash or other mineral manures, as seen by a glance at plot 4, where the further addition of mixed alkalies does not materially diminish the rate of exhaustion. The sole application of mixed alkalies on plot 3 O is attended with very little benefit, and has the effect also of rendering the exhaustion even more rapid than that of the unmanured plot. The cause of all this is manifest from the results of series A, where the addition of ammonia salts alone immediately raise the crop 13 bushels per acre. What is wanting in series O is nitrogen, and the application of other manures only tends to exhaust the land all the more rapidly by enabling a greater amount of the nitrogenous wealth of the soil to be taken away annually by the crop. When, in addition to nitrogenous manure, a quantity of superphosphate is applied, the increase in the crop is very marked, viz., 17 bushels per acre, thus shewing that there was a deficiency of phosphoric acid in the soil, and it required that both nitrogenous and phosphatic manures should be applied in order to yield a full crop. The very slight excess of 3 A over 1 A shews that there was no deficiency of potash in the soil, as

indeed there seldom is in soils which have been regularly manured with farmyard manure in ordinary rotations as this field was before it was used for the present experiment.

The plots of series AA tell the same story as those of A, and the evenness of the results obtained in the various series shews that the land was uniform and well adapted for experimenting, and it also shews that the manuring has been performed with great care, so as to bring out results which may be fully relied upon.

The 275 lbs. of nitrate of soda are given as equivalent to 200 lbs. of ammonia salts, and it will be noticed here as in the grass experiments that nitrate of soda compares favourably with ammonia salts as a nitrogenous manure.

The appearances presented by the various plots at the time of our visit were very characteristic. The unmanured plot was certainly the poorest, and consisted of dwarf pale coloured corn, with no tendency towards tillering. The heads were small and meagre, the straw thin and short, and the lower leaves so much shrivelled that the ground was not hidden. All the plots in O where ammonia was absent were starved looking, and the lower leaves and lower part of the stem were of a sickly yellow colour, shewing that the nutritive matter there had been reabsorbed by the plant and carried up to assist in the formation of the head.

In series A, plot 1 was of a dark green colour, somewhat short in the straw, but leafy, on plot 3 these characters were not so well marked, while plot 2 and 4 seemed equally good.

Farmyard manure, as shewn by plot 7 (2), has proved a very efficient manure, capable not only of maintaining but of increasing the fertility of the soil when applied at the rate of 14 tons per acre annually. It ought to be noticed, however, that 14 tons per acre of farmyard manure per annum is a very liberal application, adding to the soil an amount of dry matter far in excess of that taken off the land in the crop. The most important item of that excess as affecting the increase of crop being the nitrogen which is present in good farmyard manure in very large amount, and these 14 tons might easily contain perhaps three or four times as much nitrogen as was applied to any of the other plots. Considering this, it may seem surprising that the result was not more marked, and the explanation which suggests itself is that the nitrogenous matter in farmyard manure is only slowly decomposed, and thus only a part of it is rendered available for the use of the plant during the short period of its growth. During the long periods intervening between the successive crops, the process of decomposition still goes on, and if the soil were able to retain in its upper layer the products of that decomposition we should expect to find in spring an increase of growth of the young plant proportionate to the amount of nitrogenous

food thus liberated, but such is not the case. Either the soil retains this nitrogen in a form which renders it difficult for the plant to assimilate it, or it is carried down to depths where the plant cannot reach it, and ultimately finds its way into the drains.

The investigation of this problem has long occupied the attention of the experimenters at Rothamsted, and plot 7 (1) forms a contribution to the investigation. This plot, after the removal of the twentieth crop in 1871, had the application of farmyard manure discontinued in order to see how much of the large residue of ammonia derived from these twenty years manuring was still in the soil and available for the growth of succeeding crops. The result is that each year since the discontinuance of the manure the crop has diminished, and that the average crop during the six years in which manure has been withheld is 10 bushels less per acre than during the preceding twenty years; thus shewing that a large amount of valuable nitrogenous plant food has been carried away out of the reach of the plant. It is intended to continue the experiment until the crop on 7 (1*b*) shall have reached the same state of fertility as the unmanured plot at the beginning of the experiment (viz., 21¾ bushels per acre), and thus some information will be gained regarding the vexed question of the value of unexhausted manure.

There is another interesting point brought out in this investigation which does not appear in the above table, viz., that since the beginning of the experiments there has been a gradual increase in the weight per bushel of the barley over all the plots, amounting to from 2 to 3 pounds per bushel, but whether this is due to the increased density of the grain or its diminished size enabling it to pack closer does not appear.

The experiments upon wheat come next to be noticed. These are carried on on Broadbalk Field, which consists of about 13 acres. It was put under the first experimental crop of wheat in 1844, and has borne wheat crops continuously ever since. There was then probably no one in England who would have been rash enough to predict that after thirty-five years continuous wheat growing there would be found in this field plots showing no diminution in the quantity or quality of the annual crop; yet such is really the case, notwithstanding the many reservations and doubts as to the amount of success in the various experiments and the anticipations of probable failure of the scheme when it was first propounded.

The following table of experiments with wheat grown continuously, stating the manure per acre per annum and the produce per acre, exhibits the results obtained on the more important plots of Broadbalk Field:—

Broadbalk Field.—Experiments with Wheat Grown Continuously.

	Manure per Acre per Annum.						Produce per Acre.					
							Average Dressed Corn.			Average Straw.		
		Farmyard Manure.	Ammonia Salts.	Nitrate of Soda.	Super-phosphate.	Mixed Alkalies.	12 years, 1852-63.	12 years, 1864–75.	24 years, 1852–75.	12 years, 1852–63.	12 years, 1864–75.	24 years, 1852–75.
		tons.	lbs.	lbs.	lbs.	lbs.	bushels.	bushels.	bushels.	cwts.	cwts.	cwts.
0	1	...	...	...	1200	...	18¼	16¼	17¼	16¼	13	14¾
1	...	...	...	...	...	860	16¾	12¼	14⅜	15¾	10⅜	13
2	...	14	...	...	...	...	35¼	35	35¼	34½	32½	33½
3	...	...	...	...	...	...	15⅓	12⅜	14	14½	9¾	12⅛
5	...	...	...	...	400	400	18¾	13¾	16¼	16½	11¼	14¼
6	...	...	200	...	400	400	28⅞	22⅜	25⅝	26½	20¼	23¼
7	...	...	400	...	400	400	36⅞	32½	34¼	37½	31⅛	34⅛
8	...	...	600	...	400	400	38	37	37½	42½	40¼	41¼
9 *a*	...	...	...	550	400	400	34½	39½	36⅞	39½	44⅛	42½
9 *b*	...	...	...	550	...	...	25⅞	24½	25¼	28½	26½	27¼
10 *a*	...	...	400	...	...	...	22⅝	21½	21⅞	23¼	18½	20⅞
11	...	...	400	...	400	...	29⅜	25⅜	27½	28¾	22⅝	25⅞
15	Sown in Autumn.	...	400	...	400	400	33½	31¼	32¼	33⅞	29½	31⅞
16 *a*	1852–64	...	800	...	400	400	39⅝	...	...	46⅞	...	...
16 *b*	Unmanured since 1864.	...	...	...	...	...	...	16⅛	...	...	14½	...
17	...	...	400	...	...	...	32⅝	28⅞	30¾	33½	27⅛	30⅛
18	...	...	...	...	400	400	18⅞	14⅞	16⅞	17⅞	12⅞	15⅛

In going over Broadbalk Field we felt we were treading on what might be called classic ground, for it was the experiments conducted there which furnished Lawes and Gilbert with the materials for carrying on the great controversy with Baron Liebig regarding the employment of nitrogenous manures.

Liebig, enamoured of what is known as the "mineral theory of plant nutrition," which exalts into the first rank the application of mineral manures (such as constitute the ash of plants) for the maintenance of the fertility of the soil, and the continuous production of full crops, viewed the application of nitrogenous manures, if not as an unnecessary, at least as an unimportant condition of good farming, and considered that the supply of nitrogen present in the soil, and being continually brought thither by natural processes from the atmosphere, was sufficient for the wants of agriculture. The experiments conducted by Lawes and Gilbert led them to an entirely opposite conclusion, and they did not hesitate to join issue with the great German chemist on this subject.

Accustomed to universal deference on all matters regarding the chemistry of agriculture, Liebig was naturally impatient of the criticism of the English experimenters, and resented their strictures with characteristic vigour and eloquence. Into the history of the now famous controversy it is unnecessary here to enter. It was a strife between theory and practice, and the practical results obtained on Broadbalk Field at Rothamsted conclusively settled the question of the relative importance to agriculture of mineral and nitrogenous manures.

If the mineral or ash food of plants were sufficient to produce fertility in a soil, then plot 5 should have shown it; but the crop there is not much over that of the unmanured plot. On plot 0, which received a threefold application of superphosphate, and plot 1, which received a double application of alkaline salts, there was no corresponding increase of crop. It is plain then that the large yield on plot 3, which received annually 14 tons farm-yard manure, cannot be explained on the supposition that the mineral matters contained in it were the only effective constituents. A glance at the produce of plots 5 to 8 shows unmistakably where the increase came from. When to the mineral manures were added a small dressing of ammonia salts, only 200 lbs. per acre (plot 6), on an average of twenty-four years about 10 bushels per acre were added to the produce. When an additional 200 lbs. ammonia salts were added (plot 7), a further increase of about 10 bushels of wheat per acre was the result. When a further addition of 200 lbs. ammonia salts was applied (plot 8), there was again an increase of crop, but it amounted only to an average of $3\frac{1}{4}$ bushels per acre over the twenty-four years.

The lesson taught by the produce of these four plots, if we

take along with them plots 3 and 10, is as follows:—Plot 3, the natural soil, was deficient especially in nitrogen, and for the want of that constituent the crop was unable to make use of the mineral matter that was present to the extent that it ought to have done. In plot 10 this deficiency was made up by the addition to the natural soil of 400 lbs. ammonia salts, and the crop rose during the first twelve years from an average of 18½ to 22¾ bushels per acre. This addition of nitrogenous manure enabled the plant to make full use of the mineral food contained in the soil, for there was plenty mineral food in the natural soil, but for want of nitrogen the plant could not assimilate it. It is not surprising then that the addition of minerals (plot 5) to such a soil should have produced very little effect. As soon as ammoniacal salts were added (plot 6), the plant was able to utilise not only the original mineral food in the soil, but also a large amount of that which had been added. That it was not able to do so entirely is seen from the increase obtained on plots 7 and 8 by the further addition of ammonia salts.

The small increase of crop on plot 8 over that on plot 7 shows that the limit of profitable nitrogenous manuring on that soil has been passed—that in fact there is now an excess of nitrogenous food in the soil, and that to obtain a large increase of crop a further application of mineral salts is needed. The probability is, however, that any increase of crop by that means would be small in proportion to the increase of manure. We are plainly taught by these results that in ordinary soil there is a deficiency of nitrogen, and that without the application of some kind of nitrogenous manure the soil cannot raise crops to the extent to which its mineral wealth entitles it, and that there is a certain ratio between the nitrogenous and mineral matters in the soil which is most economical, enabling the plant to make equal use of both; that, moreover, even when that ratio is maintained, there is a limit to the quantity of well-adjusted manure which it is profitable to put upon the soil.

As to the kind of nitrogenous manure best suited to supply the natural deficiency, ammoniacal salts are here again compared with corresponding amounts of nitrate of soda, and, as in the case of the grass and the barley experiments, the advantage lies with the nitrate of soda, especially in the produce of the second twelve years.

Plots 7 and 15 are both manured in the same way—the former being manured in spring, and the latter in autumn. The slight deficiency in the crop on plot 15 may be due to the loss of some of the ammonia salts from the soil during the winter fallow.

That there is in time a great loss to the soil of ammonia is brought out very strikingly on plots 16, *a* and *b*, which received annually for twelve years the very large application of 800 lbs. ammonia salts, with the usual amount of mineral manures, and produced annually on an average 39½ bushels of wheat. If this

is compared with plot 8, it is seen that the increase of crop due to this large excess of ammoniacal manure is very small. This shows that the ammoniacal were greatly in excess of the mineral manures, probably to the extent of about 300 lbs. per acre; and one would naturally expect that this excess would remain in the soil for the use of future crops. But how different is the result here obtained. Since 1864 the manuring was discontinued, and the average crop in the next twelve years scarcely exceeded that of plot 3, which never received any manure at all. Two explanations of this extraordinary result are possible: either the mineral food has been exhausted by the previous heavy nitrogenous manuring, or the ammonia salts have disappeared from the soil. That the latter is the true explanation is made evident by the very remarkable and unexpected results obtained on plots 17 and 18.

These two plots have been nominally transposed every year, so that each received ammonia salts and minerals on alternate years. Plot 17, receiving ammonia salt one year, became plot 18, receiving minerals the next year.

It will be seen that the crop of those years during which ammonia salts were applied was nearly double the preceding and succeeding crops, which received minerals only. This seems to show that ammonia salts put into the ground one year are not available to any material extent for the crop of the next. The mineral salts, on the other hand, remain in the soil, and are available for successive seasons, if only the amount of nitrogenous manure present in the soil is sufficient to enable them to come into operation as plant food. The appearances of these two plots presented so marked a contrast that it seemed scarcely credible that they had received the same *total amount* of manure during thirty-six years. On the one whose turn it was to receive the ammonia salts this season the wheat was long and finely coloured, and seemed a heavy crop; on the other the straw was about half the length, pale, and light, and looking exactly like plot 5, which had never received any ammoniacal manure at all.

Another interesting experiment with the wheat crop was pointed out, which was long ago instituted for the purpose of testing the accuracy, or at least the applicability to the Rothamsted soil, of the Lois-Weedon method of wheat growing. The proposer of this method of agriculture—the Rev. S. Smith—described the results of a series of experiments made on certain land divided into stripes of alternate wheat and fallow. He found that by growing wheat in that way, and putting each stripe under one year wheat and next year fallow, large crops were able to be raised without the application of any manure; the rest given to the land and the more thorough tillage it received being apparently sufficient to compensate for the want of manure.

On the two plots which have been treated in that way at Rothamsted it has been found that the produce per acre is just the same as that yielded by the unmanured land which has been constantly under wheat for thirty-six years. There is, of course, this difference between the two, that whereas in the unmanured acre the whole is under a crop, and that a poor one, in the Lois-Weedon acre the half only is under a crop, and it is a good one. In order to estimate the success of the Lois-Weedon method as a means of maintaining the fertility of the soil without the application of manure, it would be necessary to put the whole acre under a crop for some time, and compare the produce with that of the continuously-cropped unmanured plot.

Other experiments with manured land under bare fallow have led the experimenters to the conclusion that it is a wasteful process, and that any crop which will cover the ground is better than none, and that chiefly on account of the power which vegetation has of preventing the rapid loss of nitrogen which occurs on a bare fallow.

A long series of experiments has also been made with leguminous crops; but, owing to accidents of weather and other causes which have not yet been explained, it has not been found possible to grow leguminous crops continuously. The land becomes "clover sick," and no manurial treatment which has been applied at Rothamsted seems to have been of any avail in preventing that peculiar condition of soil which render it unsuited to the growth of clover or other leguminous crops. The application of potash salts was the most successful, and it succeeded best when put in at considerable depths; but, no matter what manure was applied, a permanent crop was never secured. The plants seemed to be peculiarly liable to disease, and usually died off in the winter. It is an extraordinary thing, however, that upon garden soil in the neighbourhood the clover plant thrives year after year, and has been grown continuously for many years. Highly nitrogenous manures, as noticed in the grass experiments, have an injurious effect, and yet it is known that leguminous crops contain a large amount of nitrogen.

Another extraordinary result has been obtained on land which has been cropped with wheat and beans alternately. It is natural to suppose that after a crop of beans, which contain a very large proportion of nitrogen in their composition, the land would be somewhat exhausted of nitrogen, and incapable of yielding a full crop of wheat; but, so far from that being the case, it was found in the experiment with alternate wheat and beans that eight crops of wheat thus grown produced nearly as much wheat and took from the soil nearly as much nitrogen as sixteen crops of wheat which were grown consecutively in a neighbouring field. It is evident from the results of the experiments with leguminous crops at Rothamsted that we have very much to learn regarding

their nature and requirements, and that the growing of such crops continuously is a question for the future.

Regarding the experiments with root crops at Rothamsted, there is not much that can be said; the results obtained, while they furnish much valuable information, are not so striking or definite in their character as those obtained with cereals. The same care and precision of arrangement was noticed in these plots as in all the others. Owing to the long-continued wet ungenial weather they presented a miserable appearance when we saw them, and everywhere over the farm were noticed spots where the plants were rapidly being drowned out. The sight of well-planned and carefully-tended experiments going to waste reminded us forcibly of the liability of all agricultural field experiments to the varied accidents of weather, and of the need that exists to be cautious in our interpretations of these until a long succession of seasons has given us data from which average results may be obtained that are able to be looked upon as facts on which we may rely.

Besides the experimental crops we have mentioned, there are many others which a visitor to Rothamsted will have pointed out to him, and there is none from which he will not be able to derive, as he will certainly receive if he asks it, a great amount of instruction. He will find there experiments, both old and new, with sugar-beet, mangold-wurzel, potatoes, and other crops, some growing continuously, and some forming part of a rotation. He will also find there experiments with different varieties of wheat and other crops. If he is a practical farmer, he will receive from Dr Lawes more plain practical truth in one hour than he is likely to learn anywhere else in a year. If he is a chemist, he will find with Dr Gilbert a vast amount of information ready to his hand in almost all departments of agriculture; and he will find in Dr Warrington one who will explain to him and show him in practical operation some of the most delicate methods of analysis in the service of agriculture. If he is a meteorologist, he will find there in operation perhaps the best series of rain-guages and drain-guages in England, and many apparatus for the investigation of the meteorological side of agriculture, together with a great amount of statistical information on the relations of weather and crops extending over more than thirty years. If he is a physiologist, he will also find much to interest him, whether in regard to animals or vegetables. The large experiments on the nutrition of animals which were conducted for so many years at Rothamsted are now abandoned, but the specimens and analytical results belonging to these investigations are still exhibited in the Museum of the Laboratory. Physiological researches on plants are still going on, and form one of the most interesting parts of the work being done at Rothamsted.

THE AGRICULTURAL EXPERIMENTS AT WOBURN.

By Dr Andrew P. Aitken, Chemist to the Society.

The Woburn Experimental Station is on the property of His Grace the Duke of Bedford, by whom it was presented to the Royal Agricultural Society of England. It is a few miles further from London than Rothamsted, and is reached by the same line of railway, the nearest station being Woburn Sands.

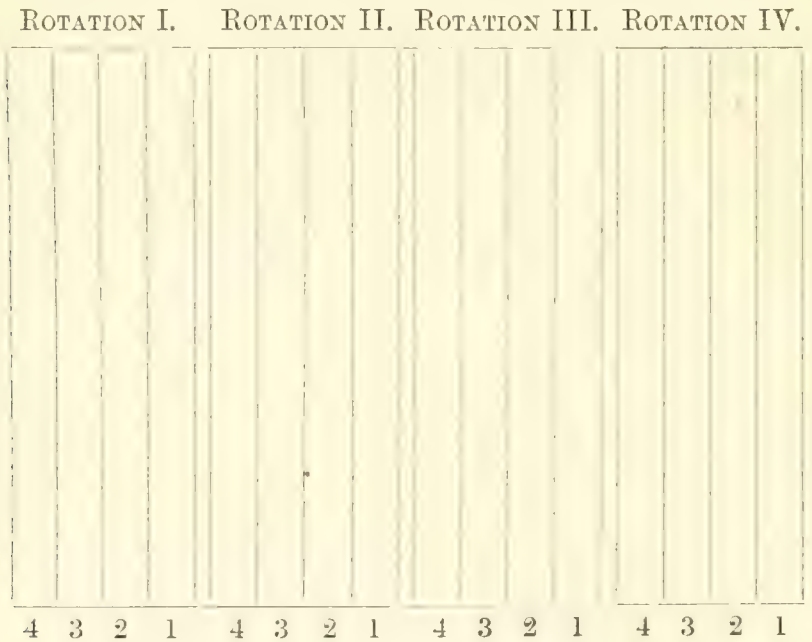
The experiments were begun in 1877, and are under the direction of Dr Völcker. Their object is "to determine the money value of the manures obtained by the consumption of different articles of food." At this time, when outgoing tenants may demand compensation for the value of unexhausted manures derived from purchased food consumed upon the land, and when the valuation of these is made a subject for arbitration, it is very important that some reliable data, derived from actual experiment, should be provided on which to found such valuations. The only serious attempt hitherto made to supply data of that kind is that of Dr J. B. Lawes, who, in an article on "The Valuation of Unexhausted Manures," published in the "Journal of Royal Agricultural Society," 1875, furnishes a list of values founded on the results of a series of feeding experiments conducted at Rothamsted many years ago. The Woburn experiments are intended to test the accuracy of these values, and the counsel and co-operation of Dr Lawes were obtained when they were being arranged and set agoing.

Besides these there is another series of experiments at Woburn on the continuous growing of wheat and barley, for the purpose of repeating on the very different soil of that district some of the more important experiments which have been going on for so many years at Rothamsted. The soil at Woburn is a light loam, with a subsoil of sand. For the main investigation regarding the values of unexhausted food-manures exactly 16 acres have been set apart; and to prevent the risk of failure from attempting too much the inquiry is limited at present to a comparison between the values of the manures derived from only two feeding stuffs,—decorticated cotton cake and maize meal,—the former of which is rich in nitrogen, and has a high manurial value, while the latter is poor in nitrogen, and has a low manurial value. The crops raised by the application of manures derived from the consumption of equal quantities of these two kinds of food will not only be compared with each other, but also with adjacent crops grown with artificial manures calculated to contain the same amounts of nitrogen, phosphoric acid, and potash as the manures derived from each of the two kinds of food referred to.

The system of cropping is a four years' rotation of roots, barley, seeds, and wheat; and to afford a sufficient check on the results,

the whole is arranged as a fourfold experiment. There are, therefore, four simultaneous rotation experiments, each occupying an area of 4 acres, and the cropping is so arranged that each of these areas is simultaneously under a different crop of the rotation, so that when Area I. is roots, Area II. will be under seeds, Area III. will be under wheat, and Area IV. will be under barley. This arrangement, besides being most convenient in other respects, possesses the advantage of preventing the continuity of the experiments from being disturbed by the occurrence of a season unfavourable to any one of the crops under rotation.

The following diagram shows the ground-plan of this part of the station :—



The actual course of cropping on the four rotation areas is as follows :—

	Rotation. I. 4 Acres.	Rotation II. 4 Acres.	Rotation III. 4 Acres.	Rotation IV. 4 Acres.
1877	Seeds	Roots	—	—
1878	Wheat	Barley	Seeds	Roots
1879	Roots	Seeds	Wheat	Barley
1880	Barley	Wheat	Roots	Seeds
1881	—	—	Barley	Wheat

The roots and seeds are eaten on the ground by sheep, and the barley and wheat are carried off. The loss which the land

sustains is therefore limited to the amount of the two crops thus carried off, and the increase in live weight of the sheep.

As all the rotations are the same, a detailed description of any one will be applicable to the others. It will be sufficient therefore to describe the course of operations on Rotation I. In 1877 it was under seeds (grass and clover). Ten sheep were put into each acre-plot to eat down the crop: those on plot 1 had 728 lbs. decorticated cotton cake given them as additional fodder: those on plot 2 received 728 lbs. maize-meal; while those on plots 3 and 4 had no additional fodder.

In 1878 the four plots were under wheat: plots 1 and 2 received no manure except that left by the sheep during the former season; plot 3 received in addition an artificial manure, containing nitrogen, phosphoric acid, and potash equal to that calculated to be contained in the manure derived from 728 lbs. decorticated cotton cake: while plot 4 received an artificial manure containing nitrogen, phosphoric acid, and potash equal to that calculated to be contained in the manure derived from 728 lbs. maize-meal. The crop was cut and carried off, and the produce of each plot weighed separately.

In 1879 the four plots were under roots, for which the land was dunged. The dung was made by four pairs of stall-fed oxen, which received as fodder per pair 5000 lbs. mangolds and 1250 lbs. wheat straw chaff, and for litter 3230 lbs. straw. Pair 1 received in addition 1000 lbs. decorticated cotton cake: pair 2 received in addition 1000 lbs. maize-meal; while pairs 3 and 4 received no additional fodder. The manure from pair 1 was applied to plot 1, that from pair 2 to plot 2, and plots 3 and 4 received the manure of pairs 3 and 4 respectively. To plots 1 and 2 no artificial manure was applied; but plot 3 received an artificial manure containing nitrogen, phosphoric acid, and potash equal to that calculated to be contained in the manure derived from 1000 lbs. decorticated cotton cake; plot 4 received an artificial manure containing these ingredients in the proportion calculated to be contained in the manure derived from 1000 lbs. maize-meal. As however the amounts of nitrogen contained in these artificial manures are more than it is expedient to apply directly to a root crop, only two-thirds of the amount of that ingredient were applied directly to the roots, the other third being reserved for the succeeding cereal crop. The mangolds thus produced, after being weighed, were left on the ground to be eaten by sheep—ten to each plot as before.

In 1880 the crop will be barley. Plots 1 and 2 will receive no manure in addition to that left by the sheep; but to plots 3 and 4 will be applied the residual amounts of nitrogen held over from last year's root crop. The barley crop will be cut down and removed, and the produce of each plot separately weighed.

The manurial treatment of each rotation area during the whole rotation may be summarised as follows:—All the plots are dunged with manure derived partly from sheep and partly from oxen. Those whose manure was applied to plot 1 received in the four years of the rotation extra fodder, consisting of 1728 lbs. decorticated cotton cake. Those whose manure was applied to plot 2 received extra fodder, consisting of 1728 lbs. maize meal. Those who supplied the manure for plots 3 and 4 received no extra fodder, but in lieu of that the plots received artificial manures considered equivalent to the manures derived from the extra fodder consumed on plots 1 and 2 respectively.

The amounts of wheat and barley produced during the rotation will thus be a measure of the value of the manures obtained by the consumption of cotton cake as against an equal amount of maize-meal, and also a measure of the value of these as against artificial manures calculated to contain the same amount of fertilising material.

Owing to the short period during which the investigation has been going on it would be premature to consider the results of the cropping as yet obtained. When a full rotation has been accomplished in each area it will be interesting to note the results, but even then it will be found expedient, or perhaps necessary, to await the results of a second or even of a third rotation before it will be possible to estimate with approximate accuracy the values of the unexhausted manures derived from the consumption on the land of decorticated cotton cake and maize-meal, and to deduce from these a series of comparative values for manurial residues derived from other forms of fodder.

The same remark applies to the other experiments on the continuous growth of white crops. They occupy an area of 5½ acres, and have been going on for three years. Into the details of that part of the work at Woburn it is unnecessary here to enter; they are very similar to those referred to as being conducted on Broadbalk Field and Hoos Field at Rothamsted.

It only remains to add that the deputation from the Society who visited the station and carefully inspected the various experiments were much pleased with the care and accuracy displayed in all the arrangements made for carrying on the investigations. They were much impressed with the liberality of the donor of the station, to whom the Royal Agricultural Society are also indebted for the use of a neighbouring farm of 90 acres, and all that it can supply in the way of horse and hand-labour and material for the successful carrying on of the experiments. An enterprise so liberally founded and maintained, and so skilfully conducted, cannot fail to achieve important results for the good of agriculture.

ACCOUNT OF THE SHOW OF THE HIGHLAND AND AGRICULTURAL SOCIETY HELD AT PERTH IN 1879.

THE Fifty-Second Show of the Society took place at Perth on the 29th, 30th, and 31st July and 1st August, under the Presidency of the Marquis of Lothian, K.T. The Society had previously met at Perth on five occasions, namely in 1829 (the first year in which the Society extended the circuit of its annual shows beyond Edinburgh and Glasgow), 1836, 1852, 1861, and 1871.

The two first shows at Perth were held within the grounds of the depot—a building erected by Government for the confinement of French prisoners, of whom it is said not fewer than eight thousand were accommodated in it. The three succeeding shows, as well as the one now to be noticed, were held on the South Inch—the site of the citadel built by Cromwell in 1652, and demolished after the restoration.

On the occasion of the last show the accommodation was ample and convenient for stock and implements as well as for spectators. The site, which is in close proximity to the railway station, occupied 33 acres, and is one of the most picturesque to be found in Scotland. It is surrounded by stately rows of chestnuts, elms, and ashes, with the Tay flowing past on one side, and commands views of that scenery for which the vicinity of Perth is so justly famed.

The arrangements of the show were under the immediate superintendence of the Secretary, and were carried out in a manner perfectly satisfactory by the General Committee, who, with much zeal and intelligence, discharged the duties connected with the different departments of the meeting. The Society, throughout the whole proceedings, had the highest reason to be gratified with the kindly feelings evinced by all classes. To the Lord Provost and Magistrates of Perth the Society was in a special degree indebted for the use of the South Inch, and the cordiality with which they afforded their assistance in all the arrangements connected with the show.

The business of the meeting began on Tuesday, the 29th July, at half-past ten A.M., when a meeting of the General Committee and Judges was held in the Committee Room, Sir Alexander Muir Mackenzie of Delvine, Bart., Chairman of the Local Committee, presiding. The stock having been placed in their respective stalls by ten, the judges entered the rings and commenced their duties at eleven, at which hour the gates were opened. In admitting the public, the same course was followed as had been adopted at all previous occasions.

The exhibition itself, if taken as a whole, was equal to anything the Society has yet had, and, when compared with those at

Perth on the five previous occasions, exhibited the following contrast—

	1829.	1836.	1852.	1861.	1871.	1879.
Cattle,	192	265	313	335	376	383
Horses,	53	46	135	155	177	253
Sheep,	199	416	662	616	684	470
Swine,	13	18	50	77	71	56
Poultry,	...	...	186	360	301	200
Dairy Produce,	...	6	123	91	88	49
Implements,	14	17	339	850	1948	2207
Premiums offered,	£357	479	900	1500	1600	2629
Gate Money and Catalogues,	£119	225	926	1328	2270	3063

The following are the detailed entries in the various classes on each of which a few general remarks have been made:—

Cattle.

Shorthorn.—Of this breed 91 animals were entered for competition, namely, 18 aged, 16 two-year-old, and 12 one-year-old bulls; 21 cows, 9 two-year-old, and 15 one-year-old heifers. The show of this favourite breed was exceedingly good, both in respect of quality and numbers. Mr Wood, Ripon, one of the judges, said, at the dinner, he had attended the Society's shows for several years, and he frankly confessed that he never saw a finer display of shorthorn cows and heifers. The aged bull class was also highly commendable, and he complimented Lord Rathdonnell, who carried the first prize in the aged bull class, on having such a splendid animal, the like of which had never been seen before, and which had been awarded the Tweeddale Gold Medal for the best shorthorn animal in the yard. It may be added that "Anchor," the bull referred to, was bred by the late Mr Richard Chaloner, Kingsfort, County Meath, and that he carried the first prize at Kilburn, Dublin, and Newry, in addition to that at Perth. It is also worthy of notice that the first prize cow and the first prize yearling heifer are full sisters.

For the details of the several awards in this as well as in the other classes, reference is made to Appendix A, page 46.

Polled Angus or Aberdeen.—The number of this breed was 97, namely, 7 aged, 7 two-year-old, and 15 one-year-old bulls; 22 cows, 19 two-year-old, and 27 one-year-old heifers. The collection, as regards extent and quality, was one of the best that ever appeared in any showyard. This was to have been expected from the vicinity of the show to the head-quarters of many polled herds.

Galloway.—Of this breed 33 animals were entered, namely, 3 aged, 3 two-year-old, and 3 one-year-old bulls; 9 cows, 6 two-year-old, and 9 one-year-old heifers. The exhibition, though

limited in number, was remarkably good, some of the best specimens of the breed being forward.

Ayrshire.—The number of this breed was 57, namely, 3 aged, 9 two-year-old, and 9 one-year-old bulls; 23 cows in milk and cows or heifers in calf, 5 two-year-old, and 8 one-year-old heifers. Notwithstanding the show being held at some distance from the native seat of the breed, there was a good display.

Highland.—The number produced was the same as the Ayrshires, 57, namely, 7 aged, 4 three-year-old, and 13 two-year-old bulls; 12 cows, 9 three-year-old, and 12 two-year-old heifers. This was regarded as a splendid show, and one of the finest that the Society has had for many years. The class attracted a good deal of notice, the principal herds in the country being represented.

Fat Stock.—The number of animals entered was 37, namely, 9 four-year-old, and 4 three-year-old Highland oxen; 3 three-year-old, and 4 two-year-old polled oxen; 4 three-year-old, and 6 two-year-old pure or cross-bred oxen; 3 three-year-old, and 4 two-year-old cross-bred heifers. This was a fair average display, both in point of numbers and quality.

Extra Cattle.—The extra cattle consisted of—Mr Ferguson's polled bull "Shah," winner of the first prize at Dumfries in 1878; 2 Highland heifers shown by the Earl of Seafield and the Hon. the Master of Blantyre; an American shorthorn ox, exhibited by Messrs Bell & Sons, Glasgow, which attracted much interest; a Guernsey bull, exhibited by the Earl of Breadalbane, and 2 Alderney cows, by Mr H. W. Pople, Perth; a bull and cow with calf of the Indian breed were shown by Sir John W. P. Orde, who also exhibited a pair of semi-wild white cows with calves from the Kilmory herd. They were small-horned animals, resembling the Highland breed, and at their stalls much interest was manifested. As will be observed from the awards, medium gold medals were voted for 4 of the animals, minor gold medals for a similar number, and silver medals for 2.

Horses.

For Agricultural Purposes.—Of this class 190 animals were entered, namely, 24 aged stallions, 26 three-year-old, 25 two-year-old, and 22 one-year-old colts; 8 mares with foals at foot, 19 mares in foal, 16 three-year-old, 20 two-year-old, and 20 one-year-old fillies; 5 aged and 5 three-year-old draught geldings. To many it was in this department the chief interest was found, in respect that almost every animal of note was entered. The display was excellent, particularly the aged stallions and the mares.

Hunters and Roadsters.—The number of animals entered under this head was 37, namely, 8 brood mares with foals at foot, 7 aged and 7 four-year-old mares or geldings suitable for field, 9 mares or geldings suitable as hackneys or roadsters; 2 mares for jump-

ing; and 4 thoroughbreds entered as extra stock. The turn out in this department was fair; some of the animals being above the usual average in point of merit. Of the animals shown as extra stock, several possessed much merit and were very highly commended by the judges.

Ponies.—Of this class 26 animals were entered, namely, 2 stallions 14½ hands and under, 3 mares between 13 and 14½ hands, 9 mares or geldings above 12½ hands, and 9 geldings under 12½ hands; and 3 ponies entered as extra stock, one of them being the first prize pony stallion at Aberdeen in 1876, and another the first prize pony stallion at Dumfries in 1878. A good show: small in numbers, but superior in quality and appearance.

Sheep.

The exhibition of sheep was less numerous than on the three last shows at Perth. The total number exhibited was 470, comprising 144 Blackfaced, 74 Cheviots, 87 Border Leicester, 36 English Leicester, 11 Cotswolds, 58 Shropshires, 20 Blackfaced wethers, 10 half bred wether hoggs, and 20 cross bred wether hoggs, and 10 Shropshire wethers.

Blackfaced.—Of this breed there were 76 entries, namely, 6 aged, 12 two shear, and 46 shearling tups; 4 pens of ewes with lambs, and 8 pens of shearling ewes or gimmers. The breed was well represented, and perhaps the best display that the Society has had for some years.

Cheviot.—The number of entries of this breed was only 31, namely, 4 aged, 9 two shear, and 11 shearling tups; 3 pens of ewes with lambs, and 4 pens of shearling ewes or gimmers. For various reasons there was not a large show of Cheviots, but the specimens shown were esteemed a superior lot, particularly the shearling ewes.

Border Leicester.—Of this breed there were 55 entries, namely, 7 aged, 6 two shear, and 34 shearling tups; 3 pens of ewes, and 5 pens of shearling ewes or gimmers. The entire number was good, the shearling tups excellent, the best show of them that has been seen for some years.

Leicester.—The number of entries of English Leicesters was 16, namely, 5 aged and 6 shearling tups, 3 pens of ewes, and 2 pens of shearling ewes or gimmers. The competition of English Leicesters was confined to two exhibitors. The specimens shown were not considered superior to what has been seen at previous shows.

Cotswold and Lincoln.—Only 3 entries were made, namely, 1 shearling tup, 1 pen of ewes, and 1 pen of shearling ewes or gimmers. They were all of the Cotswold breed, and were exhibited in fine condition.

Short Woolled.—The number of entries was 26, all of the Shropshire breed, namely, 7 aged and 11 shearling tups, 1 pen of ewes, and 7 pens of shearling ewes or gimmers. This was one of the largest, and said to be the best display of Shropshires ever seen at the Society's shows.

Extra Sections.—Of the six sections, there was competition in only three, namely, 4 pens of Blackfaced wethers, 2 pens of half bred wether hoggs, and 4 pens of cross bred wether hoggs.

Extra Sheep.—The number of entries of extra sheep was only three, namely, a Shropshire wether, 5 Shropshire wether hoggs, and 4 Shropshire cross wether hoggs. The animals being of superior merit were all either very highly or highly commended by the judges.

Swine.

Of swine there were 40 entries, namely, 2 boars, 5 sows, and 4 pens of pigs of the large breed; 7 boars, 9 sows, and 2 pens of pigs of the black or Berkshire breed; 4 boars, 5 sows, and 2 pens of pigs of the small breed. The display of swine was quite up to an average in point of quality, many of the animals being considered superior representations of some of the most famous English breeders.

Poultry.

Of poultry there were 157 entries by 46 exhibitors. Although not equal to the two last meetings at Perth as regards numbers, the show was exceedingly good in respect of quality. The best display was in the class of dorkings, there being 35 entries of the various kinds, and many of the birds of considerable merit. There was also a fair show of game birds and bantams.

Wool.

The exhibition of wool was not large, there being only 11 entries in all, namely, 1 of Cheviot white wool, 8 of Blackfaced white wool, and 2 of Leicester wool. By the regulations the specimens were shown as clipped off the sheep, and the Blackfaced fleeces were unwashed.

Dairy Produce.

The number of exhibitors of dairy produce was 18, and the number of entries 49, namely, 12 of cured butter, 10 of powdered butter, and 14 of fresh butter; 7 of Cheddar cheese, 2 of Dunlop cheese, and 4 of other varieties. Several of the samples, both of butter and cheese, were considered of excellent quality.

Implements and other Articles.

In accordance with the wishes of the Scottish Implement and Engineers' Association, no money prizes or medals were offered

for implements of any kind, and no inspection of them by judges took place. Notwithstanding this, the exhibition in point of numbers was exceeded only on three previous occasions. The collection embraced almost every kind of implement used in agriculture, and contributed in no small degree to the interest and importance of the show. The number of stalls was 200, occupied by 194 individual exhibitors (70 of whom were from England, and 1 from Ireland), showing 2207 articles, the total value of which, according to their ordinary selling price, amounted to nearly £33,000.

Miscellaneous.

Among what may be termed the objects of curiosity at the show were the hatching trays and tanks with Lochleven trout shown by Sir James R. Gibson Maitland, Bart., who has for several years carried on a system of breeding of Lochleven trout in ponds at Sauchie, Stirlingshire, from the spawn of the trout taken from the loch. Several specimens of the fish produced from the ova were exhibited at the age of two and four years old respectively, the largest being on an average about 4 lbs. in weight. During the last three years, Sir James has been able to return about 300,000 trout to Lochleven.

Numerous specimens of native manufacture, consisting of tweeds, blankets, tartans, plaids, and other woollen fabrics, were exhibited by Messrs P. & J. Haggart, Keltneyburn, Aberfeldy.

Messrs Dickson & Turnbull, nurserymen, Perth, exhibited a fine assortment of coniferous and other plants; and a choice collection of grain, grass, and other seeds.

Specimens of photography were shown by Mr Magnus Jackson, Marshall Place, Perth, and Mr John Urie, Caledonian Road, Perth.

The Caledonian Apiarian and Entomological Society held their exhibition of honey, hives, and bees in a corner of the showyard. To the general public the chief feature of interest was the competition in manipulating live bees. This was carried on in the British beekeepers' tent, where the visitors were protected from the bees by a gauze screen. Bee driving competitions took place each day at 2 o'clock, and explanations on new hives and bees were given by eminent bee masters.

In the evening of the first day of the show (Tuesday, 29th July), the usual dinner of the Directors and Judges took place in the Royal George Hotel, when Mr Gillon of Wallhouse, as Chairman of the Standing Committee on General Shows, presided.

On Wednesday morning the public were admitted at eight o'clock. The prize cattle were paraded at 10.30, and the horses

at 12.30 and 3.45. These parades proved on this, as on former occasions, to be one of the most attractive features in the yard. In terms of the resolution by the anniversary meeting in January 1879, a general meeting of members took place at 1.30, a full report of which will be found in Appendix A, page 24.

The President's Dinner took place in the County Hall at 7 P.M., on Wednesday, when the Marquis of Lothian occupied the chair, and the Hon. George Waldegrave Leslie and Sir Alexander Muir Mackenzie acted as croupiers. Among others present were :— the Earl of Elgin, Lord Oranmore and Browne, Lord Rathdonnell, Viscount Stormont, the Hon. Robert O'Neill, Lord Provost Richardson, Perth; Sir George Douglas Clerk, Sir Robert Menzies, Sir William Forbes, Mr Irvine of Drum, and Mr Gillon of Wallhouse. The Noble Chairman, in giving the toast of the evening, —The Highland and Agricultural Society of Scotland,—said his first duty was to congratulate the Society upon the success which had attended their meeting this year at Perth. He did not refer either to the number of exhibits or to the receipts, but he thought none who had been around the showyard could doubt but that in quality this show came up to any one previously held. Taking the sections all round, they were most admirable. Whether they looked to the Clydesdales, the Shorthorns, the Galloways, the Blackfaced, or even the machinery, he thought it was a show which would add to the reputation of the Highland Society. The great object of the Society was to excite a spirit of emulation, and he thought it showed a great deal of honest spirit of emulation that, notwithstanding the low spirits in which they had all been inclined to indulge in for some time, exhibitors had been enabled to send such a fine show to the yard. Not only had the show been a success, but they had had a novelty in the showyard. He referred to the first general meeting held there. He himself thought that in many ways it was exceedingly desirable that every opportunity should be given to the members of the Society to meet together, in order to bring forward anything that might be for the benefit and interest of the Society. He thought that the idea had taken root, that in consequence of the meetings being held in Edinburgh only, that they were, therefore, hole and corner meetings. This was a complete mistake, and none who knew anything about the way in which the business of the Society was conducted could come to that opinion. While he thought it desirable that those who had suggestions to make should have them properly discussed, at the same time caution was necessary. They must remember that motions could be brought forward at a meeting such as that held that day, raising questions which might have a vital effect upon the prospects of the Society, and might be carried without proper consideration of their effects. While he hoped that he had not

exceeded his duties that day, he had still ventured—not as Chairman, but as President of the Society—to say that there was danger in carrying motions to which it was impossible to give due consideration. Alluding to the recent depression in the country, the Noble Chairman expressed the hope that one result of it would be to unite landlords and tenants still more. Their interests were so absolutely identical that if one was in misfortune the other suffered also; and in the future, whatever difficulties might arise, he hoped each would recognise the rights and aspirations of the other, so that out of the evil which had afflicted the country for some time good might come to the landlords and tenants of Scotland. Lord Oranmore and Browne proposed The National Agricultural Societies of England and Ireland, to which Mr H. M. Jenkins, secretary of the Royal Agricultural Society of England, replied. Among other toasts were, The President of the Society, given by Lord Provost Richardson; The Croupiers, by Mr Stuart Gray of Gray and Kinfauns; The Judges, by the chairman, and replied to by Mr John Wood, Ripon; The Successful Competitors, by Mr Young of Cleish, and responded to by Lord Rathdonnell; The Committee of Supervision, by Mr Gillon of Wallhouse, and acknowledged by Sir Alexander Muir Mackenzie. At the close of the dinner, three hearty cheers were given for the Noble President.

On Thursday the yard was again opened at 8 A.M. The prize cattle were paraded at 10.30, and the horses at 12.30 and 3.30 P.M. The evening was agreeably spent in a brilliant and fashionable ball in the County Hall. The music was supplied by Messrs R. J. & R. Adams' quadrille band of Glasgow. The arrangements of the committee were very complete, and admirably carried out by Mr Melville Jameson, who acted as local secretary.

On Friday the yard was opened at the same hour, and the usual parade of prize cattle took place at 9.30, and of horses at 11 A.M. and 3 P.M. The show terminated at 5 P.M., at which hour the removal of the stock began.

The health of the stock was exceedingly good, no case of disease having come under the notice of Principal Williams, or of the two local veterinary surgeons who were in close attendance during the show.

The yard was erected by Mr Mathew Richardson, Annan, the Society's contractor. The refreshments were purveyed by Messrs Robert Wilson, Perth: Aitchison Sons & Mitchell, Edinburgh; John Warner, Edinburgh; and Albert M. Thiem of the Windsor Hotel, Edinburgh. The contractor for the supply of forage was Mr W. S. Ferguson, Friarton, Perth; the quality of grass, hay, and tares was excellent, and gave general satisfaction.

On Wednesday and two following days the bands of the

Royal Perthshire Rifles and the Fechney Industrial School were in attendance, and enlivened the proceedings with excellent music. The pipers of Sir Robert Menzies and Colonel Macdonald of St Martins also entertained the visitors to some fine airs.

Except on Thursday and early in the morning of Friday, the weather was all that could have been desired for the purpose of the show. The interest taken by the public in the meeting was displayed in a very gratifying manner in the great concourse of visitors, not only from the counties more immediately connected with it, but from other portions of the kingdom and even abroad. All expressed themselves highly pleased with the show and the whole arrangements.

EXPERIMENTAL STATIONS.—REPORT FOR 1879.

By Dr Andrew P. Aitken, Chemist to the Society.

EXPERIMENTS AT HARELAW AND PUMPHERSTON.

In the report of the experiments published last year ("Transactions," vol. xi. p. 200), it was explained that, owing to the lateness of the season and the severity of the winter, it was found impossible to secure the crops in time to enable the results of the first year's cropping to form part of that report. Observations taken during the growing season were, however, recorded in it, and these need not be repeated here; but as they bear directly on the results here tabulated, it will be found useful to refer to them before proceeding to the present report.

It will be seen from the results given in the subjoined table that the crop on both stations is a small one, and it is just possible that a practical farmer, casting a rapid glance over these figures, and knowing that he is able to produce much better crops without a tenth of the care and trouble that has been bestowed upon these, may consider it scarcely worth his while to pursue the subject any further, and may conclude that, if such crops as these are the result of the application of science to turnip-growing, the less he has to do with science the better. To reason thus would be a great mistake, for, in the first place, the production of large crops is no part of the scheme of experiments undertaken by the Society. So far from that being the case, it was the aim of those who had the selection of the stations to choose the poorest land that was otherwise suitable, and the only fault to be found with Harelaw station is that the soil is not poor enough. Again, no farmyard manure was applied to the land, although it was at the beginning of a new rotation, nor is there any immediate intention of applying it. The scheme is a contest between the various forms of artificial manures. Lastly,

the season was one of the severest on record, and the whole of the crop at Harelaw, and more than half of that at Pumpherston, lay in the ground until the middle of March.

The crop at Harelaw was Swedes, that at Pumpherston was Fosterton hybrid, and the following were the weights of bulbs taken from the various plots, reckoned per acre:—

TURNIP CROP 1878–9.

No. of Plot.	HARELAW STATION.				PUMPHERSTON STATION.			
	Rood plots.		$\frac{1}{112}$ acre plots.		Rood plots.		$\frac{1}{112}$ acre plots.	
	tons.	cwts.	tons.	cwts.	tons.	cwts.	tons.	cwts.
1	14	16	11	2	23	8		
2	16	2	13	19	19	7		
3	15	0	12	11	20	9		
4	15	16	14	0	22	3		
5	13	7	13	2	16	2		
6	15	1	13	14	20	3		
7	15	7	12	12	20	4		
8	16	9	12	11	21	6		
9	15	7	11	9	18	17		
10	16	9	12	13	20	17		
11	13	2	11	17	12	1		
12	12	8	10	12	9	7		
13	11	14	11	9	14	18		
14	11	8	11	11	14	6		
15	11	11	11	15	6	3		
16	11	12	10	14	17	11		
17	11	12	10	3	7	3		
18	11	4	9	12	10	9		
19	11	18	11	8	13	4		
20	11	18	7	15	10	12		
21	10	12	9	9	9	16		
22	10	4	8	15	3	10		
23	10	3	...		12	9		
24	9	8	...		6	14		
25	11	4	...		10	6		
26	12	1	...		8	10		
27	10	13	7	15	5	4		
28	10	19	...		7	5		
29	11	5	...		10	18		
30	12	8	...		6	4		
31 *a*	11	4	...		12	16		
31 *b*	12	0	...		13	16		
32 *a*	10	18	...		7	8		
32 *b*	11	2	...		7	8		
33 *a*	10	8	...		7	14		
33 *b*	11	10	...		11	18		
34 *a*	11	2	...		9	6		
34 *b*	11	14	...		9	8		
35 *a*	9	2	...		11	9		
35 *b*	11	0	...		8	10		

The crops on these plots, on account of great inequality of soil, were not weighed.

On looking over the results of the cropping at Harelaw, it is noticed that plots 1 to 12 are superior to all that follow. The reason of that is that these twelve plots were sown nearly a fortnight earlier than the others, whose sowing was delayed by the interference of a week of continuous rain. The sowing of the $\frac{1}{112}$ acre plots was also delayed a fortnight.

On Pumpherston the first plots also are the best; but that is due to a different cause. All were sown at the same time, but plots 1 to 17 were lifted in January, while the others, owing to a recurrence of frost, remained in the ground till March. With these explanations we may now examine the results a little more closely.

Let us take in the first place plots 1 to 10. These are known as the phosphate plots, and are set apart to determine the relative efficiency of the various forms of phosphates of animal and mineral origin, dissolved and undissolved. All these plots received exactly the same amount of phosphoric acid, potash, and nitrogen. The forms in which these were given, and the weights per acre, will be seen by referring to the tabulated scheme, pages 292, 293, 294.

Since all received the same amount of manurial matter, any differences found in them will be due to the *form* in which it was applied. In the following tables the odd numbers are the undissolved phosphates, and the even numbers the same dissolved:—

HARELAW ROOD PLOTS.

Plot.	Phosphatic Manures.	Undissolved.		Dissolved.		Average of both.	
		tons.	cwts.	tons.	cwts.	tons.	cwts.
1 and 2	Bone ash . . .	14	16	16	2	15	9
3 „ 4	Ground coprolites . .	15	0	15	16	15	8
5 „ 6	Bone dust . . .	13	7	15	1	14	4
7 „ 8	Phosphatic guano . .	15	7	16	9	15	18
9 „ 10	Ground apatite . .	15	7	16	9	15	18
	Average . . .	14	15	15	19	15	7
HARELAW $\frac{1}{112}$ ACRE PLOTS.							
1 and 2	Bone ash . . .	11	2	13	19	12	10
3 „ 4	Ground coprolites . .	12	11	14	0	13	5
5 „ 6	Bone dust . . .	13	2	13	14	13	8
7 „ 8	Phosphatic guano . .	12	12	12	11	12	11
9 „ 10	Ground apatite . .	11	9	12	13	12	1
	Average . . .	12	3	13	7	12	15

PUMPHERSTON ROOD PLOTS.

Plot.	Phosphatic Manures.	Undissolved.		Dissolved.		Average of both.	
		tons.	cwts.	tons.	cwts.	tons.	cwts.
1 and 2	Bone ash . . .	23	8	19	7	21	7
3 „ 4	Ground coprolites . .	20	9	22	3	21	6
5 „ 6	Bone dust . . .	16	2	20	3	18	2
7 „ 8	Phosphatic guano . .	20	0	21	6	20	15
9 „ 10	Ground apatite . .	18	17	20	17	19	17
	Average . . .	19	16	20	15	20	5

These three sets of experiments speak with one voice. Not only are the averages in favour of the dissolved phosphates, but the individuals forming them are nearly all so, with one notable exception,—plot 1 at Pumpherston. There is no doubt that it is too high. This is not due to any mistake in the experiment, but to the superiority of the land on that one plot, a superiority which is confirmed by the result of this year's barley crop, and which is explained by a treatment the land received before the station was established.

Had that plot been normal, the average crop on the undissolved plots at Pumpherston would have been about 19 tons. The averages of these united experiments would then be for the undissolved phosphates 15 tons 6 cwts., and for the dissolved plots 16 tons 14 cwts., showing that about 10 per cent. more turnips were produced by the dissolving of the phosphates.

On examining the third columns of these tables to see which form of phosphate was most effective, we find the results are somewhat conflicting. The least productive are the bone dust plots, but that is probably to be ascribed as much to the less active form of nitrogen contained in bone as to inferiority in the form of phosphate.

The results of the analyses of the crops on these plots come next to be considered. The analysis of a turnip crop is a difficult undertaking, and to be perfectly reliable must be conducted on a very large scale; the samples must be very numerous and carefully selected. In sampling this crop forty turnips of average size were picked from each plot and analysed in batches of ten at different times, and in the results recorded below it is the averages of these analysis that are taken. Forty turnips per plot is however too small a number, and in future five times that amount will be taken, and means of analysis adopted on a much more extensive scale. It should therefore be remembered in noting the following analytical results that they are derived from very small samples, and, though executed with the greatest

care, cannot be considered more than approximations to truth. We shall take first the percentage of water and solid matter in the bulbs, and also the total solid matter per acre on both stations—

	Harelaw.			Pumpherston.		
	Water per cent.	Solids per cent.	Solids per acre.	Water per cent.	Solids per cent.	Solids per acre.
			cwts. lbs.			cwts. lbs.
1	89·68	10·32	30 61	91·15	8·85	41 47
2	90·87	9·13	29 45	91·14	8·86	34 32
3	90·21	9·79	29 41	90·63	9·37	38 36
4	90·38	9·62	30 45	91·02	8·98	38 87
5	89·10	10·90	29 11	91·15	8·85	28 55
6	91·28	8·72	24 100	90·50	9·50	38 33
7	90·74	9·26	28 48	90·28	9·72	39 29
8	91·45	8·55	28 14	90·35	9·65	39 0
9	90·05	9·95	30 61	91·19	8·81	33 24
10	91·26	8·74	28 84	90·87	9·13	38 10
11	90·66	9·34	24 52	91·06	8·94	21 60
12	89·77	10·23	25 37	91·30	8·70	16 29
13	90·13	9·87	23 9	91·08	8·92	26 66
14	90·44	9·56	21 88	90·13	9·87	28 25
15	89·82	10·18	23 57	90·44	9·56	11 84
16	90·37	9·63	22 38	92·00	8·00	28 10
17	89·79	10·21	23 76	90·85	9·15	13 9
18	90·94	9·06	20 32	92·52	7·48	19 91
19	90·39	9·61	22 97	93·75	6·25	16 56
20	89·98	10·02	23 94	91·18	8·82	18 77
21	90·25	9·75	20 75	92·55	7·45	14 67
22	89·64	10·46	21 37	90·97	9·03	6 35
23	89·83	10·17	20 70	90·03	9·97	24 92
24	90·14	9·86	18 59	91·07	8·93	12 0
25	...	...	...	90·44	9·56	19 17
26	88·65	11·35	27 39	90·02	9·98	16 107
27	90·65	9·35	19 100	89·04	10·96	11 44
28	88·70	11·30	24 83	89·78	10·22	14 91
29	90·73	9·27	20 96	89·94	10·06	21 91
30	89·20	10·80	26 87	90·08	9·92	12 33
31 *a*	90·74	9·26	20 83	90·16	9·84	25 10
31 *b*	90·59	9·41	22 65	90·06	9·94	27 48
32 *a*	...	...	...	89·39	10·61	15 78
32 *b*	90·58	9·42	20 102	89·24	10·76	15 103
33 *a*	90·19	9·81	20 50	89·04	10·96	16 96
33 *b*	99·93	9·07	20 96	89·27	10·73	25 59
34 *a*	89·34	10·66	23 74	89·86	10·14	19 95
34 *b*	89·59	10·41	24 40	89·90	10·10	19 0
35 *a*	90·12	9·88	18 0	...	...	...
35 *b*	89·79	10·21	22 51	...	...	...
38 *a*	89·06	10·94	...	...	...	...
38 *b*	88·79	11·21	...	...	...	...

The average amount of solid matter in turnips is seen to be less than one-tenth of their total weight, and the Swedes at Harelaw do not contain on the average more than the yellow turnips at Pumpherston.

Despite the great weight of the turnip crop, if we subtract from it the nine-tenths consisting of water, there is left a total amount of dry matter per acre very little more than that contained in the grain and straw of a white crop.

If we arrange the results of the first ten plots, so as to compare the produce of the plots with dissolved and undissolved phosphates, we obtain the following numbers:—

HARELAW STATION.

	Water per cent.		Solid Matter per cent.		Solid Matter per acre.			
	Undissolved.	Dissolved.	Undissolved.	Dissolved.	Undissolved.		Dissolved.	
					cwts.	lbs.	cwts.	lbs.
Bone ash . .	89·68	90·87	10·32	9·13	30	61	29	45
Ground coprolites	90·21	90·38	9·79	9·62	29	41	30	45
Bone dust . .	89·10	91·28	10·90	8·72	29	11	24	100
Phosphatic guano .	90·74	91·45	9·26	8·55	28	48	28	14
Ground apatite .	90·05	91·29	9·95	8·64	30	61	28	84
Average . .	89·95	91·05	10·05	8·95	29	73	28	35

PUMPHERSTON STATION.

Bone ash . .	91·15	91·24	8·85	8·76	41	47	33	90
Ground coprolites .	90·63	91·02	9·37	8·98	38	36	38	87
Bone dust . .	91·15	90·50	8·85	9·50	28	55	38	33
Phosphatic guano .	90·28	90·35	9·72	9·65	39	29	39	0
Ground apatite .	91·19	90·87	8·81	9·13	33	24	38	10
Average . .	90·88	90·79	9·12	9·21	36	18	37	66

On the Harelaw plots the result of dissolving the phosphates seems to have been to increase the amount of water contained in the Swedes in every instance. Considering, however, that on those plots the crop was larger and the growth more vigorous, that is not a surprising result. The important point to notice in such cases is the effect which is produced upon the total yield of solid matter per acre, and in this instance we see, by comparing the numbers of the last two columns, that the total amount of solid matter was diminished by the application of that form of manure. The smaller crops produced by the undissolved phospthates actually contained a larger amount of solid matter, or, in other words, of food per acre, than the larger crops produced by

the same amount of phosphates in the dissolved state. The greater size and weight of bulbs is therefore no index of the amount of solid matter they contain, nor of their feeding qualities, and, in view of that circumstance, it may well be questioned how far we are right in encouraging the growth of these monstrous bulbs which are exhibited at our agricultural shows, and which are commended mainly on account of their enormous size. The smaller bulbs grown with undissolved phosphates at Harelaw contained about 10 per cent. more solid matter, and the amount per acre of solid food grown on the undissolved phosphate plots exceeded that grown on the others by about 4 per cent.

This is a subject, however, on which we must not be too hasty in our conclusions, for, on comparing the results obtained at Pumpherston, we find that while some plots corroborate the Harelaw experiments, others do not, and the average yield of the plots with dissolved phosphates shows an increase of solid matter per acre quite proportionate to their increase of total crop. The comparative failure of the crop on plot 5, which received bone dust, is no doubt in great measure the cause of the low average of the undissolved plots, and it is highly probable that future experiments on that plot will show a larger crop, when the unexhausted phosphate has had time to come into operation. When we consider, also, the greater evenness of the land at Harelaw, and the more favourable conditions under which the phosphate plots were sown at that station, we naturally put more reliance on the results obtained there, and look forward with considerable interest to the information which future experiments will yield regarding the effect which the dissolving of phosphates has upon the total produce of solid matter in the turnip crop.

Before passing from this subject it may be noticed that the specific gravity of the sap of the turnips grown on all the plots at both stations was carefully determined, and the numbers obtained for the phosphate plots confirm the results obtained above. They were as follow:—

	Harelaw.		Pumpherston.	
	Undissolved.	Dissolved.	Undissolved.	Dissolved.
Bone ash . .	1·0351	1·0344	1·0310	1·0313
Ground coprolites .	1·0365	1·0334	1·0298	1·0300
Bone dust . .	1·0356	1·0316	1·0309	1·0309
Phosphatic guano .	1·0345	1·0335	1·0307	1·0309
Ground apatite .	1·0352	1·0342	1·0322	1·0322
Average . .	1·0354	1·0334	1·0309	1·0310

The specific gravity of the sap of the Swedes manured with undissolved phosphates was greater than that of the others; that is to say, the sap was less watery. The differences between the two sets of yellow turnips were slight, and on the average they are practically equal as regards density of sap.

	Harelaw.				Pumpherston.			
	Albumenoids in dry matter per cent.	Albumenoids per acre.	Ash in dry matter per cent.	Ash per acre.	Albumenoids in dry matter per cent.	Albumenoids per acre.	Ash in dry matter per cent.	Ash per acre.
		lbs.						lbs.
1	10·2	349	7·55	258	7·8	362	9·60	444
2	9·8	322	7·54	247	6·9	264	8·57	324
3	10·3	338	6·00	196	6·3	270	9·07	389
4	9·4	319	7·70	262	6·0	268	9·26	412
5	9·5	309	6·81	222	7·1	227	9·91	316
6	9·8	273	8·26	230	6·0	257	9·61	411
7	10·7	340	7·67	244	6·2	272	8·17	359
8	9·9	313	8·40	264	6·0	262	8·88	408
9	11·0	378	6·38	217	6·8	250	9·29	346
10	9·5	306	8·21	264	6·2	201	8·39	358
11	10·5	267	7·29	200	6·1	147	10·03	242
12	9·2	261	6·48	158	6·9	126	9·29	168
13	9·5	246	7·47	186	6·9	205	8·03	239
14	8·7	212	7·41	178	6·0	190	8·43	265
15	11·3 (?)	297	6·67	174	6·8	89	8·92	117
16	11·7 (?)	293	6·98	174	7·5	235	9·86	310
17	...	...	...	...	7·0	103	8·61	126
18	...	...	7·17	162	6·0	133	9·17	203
19	...	...	6·50	166	...	...	9·32	172
20	...	...	6·66	178	...	...	9·35	195
21	10·4	240	6·03	129	...	...	9·92	162
22	6·1	147	6·13	146	...	...	8·82	62
23	7·8	180	6·46	149				
24	8·7	176	6·70	139				
25	...	...	...	...				
26	8·7	226	6·66	207				
27	7·8	173	6·77	151				
28	8·6	238	6·95	192				
29	7·7	180	6·89	161				
30	10·3	309	6·47	194				
31 *a*	8·8	193	6·12	142				
31 *b*	11·2	283	6·92	175				
32 *a*	8·8	...	6·26	...				
32 *b*	8·0	187	6·45	151				
33 *a*	9·5	226	6·73	154				
33 *b*	8·9	207	7·89	184				
34 *a*	10·0	265	6·13	162				
34 *b*	...	...	6·57	178				
35 *a*	...	...	7·13	143				
35 *b*	...	...	7·74	194				
38 *a*	...	...	7·50	...				
38 *b*	...	...	6·65	...				

Of the solid matter contained in turnips, the ash and albuminoid matter are the most important; the former as it affects the more or less rapid exhaustion of the soil where the crop is taken off the ground, and also the richness of the manure derived from their consumption; and the latter as it affects the feeding value of the turnip. The amounts of these two constituents were estimated in the samples of nearly all the plots at Harelaw, and in those samples of the Pumpherston crop that were considered worth analysing, and were as in the foregoing table.

In the third column of each side of the table is contained the percentage of ash contained in the dry matter of the various plots; and from these numbers and the total amounts of dry matter per acre there have been calculated the total amounts of ash per acre, which are contained in the fourth column. From the smallness of the samples taken, these numbers must be regarded as indications rather than as accurate expressions of truth, and are chiefly serviceable as pointing out a direction in which, with larger samples and larger means of investigation, useful information may be expected from the analyses of future crops.

As regards the effect of dissolved and undissolved phosphates upon the ash of turnips, the results of the first ten plots, arranged as under, give some very well-marked indications.

HARELAW.

Plots.		Percentage of Ash in dry matter.		Mineral matter abstracted from Soil per acre.	
		Undissolved.	Dissolved.	Undissolved.	Dissolved.
				lbs.	lbs.
1 and 2	Bone ash	7·50	7·54	257	247
3 „ 4	Ground coprolites . .	6·00	7·70	196	262
5 „ 6	Bone dust	6·81	8·26	222	230
7 „ 8	Phosphatic guano . .	7·67	8·40	244	264
9 „ 10	Ground apatite . . .	6·38	8·21	217	264
	Average	6·87	8·02	227	253

PUMPHERSTON.

1 and 2	Bone ash	9·60	8·57	444	324
3 „ 4	Ground coprolites . .	9·07	9·26	389	412
5 „ 6	Bone dust	9·91	9·61	316	411
7 „ 8	Phosphatic guano . .	8·17	8·88	359	408
9 „ 10	Ground apatite . . .	9·29	8·39	346	358
	Average	9·19	8·94	371	382

On Harelaw the effect of applying dissolved phosphates has been to increase the percentage of ash considerably, and this increase is seen to be quite regular over all the plots. At Pumpherston the results seem to point in an opposite direction, the average amount of ash in the undissolved being slightly over that of the dissolved phosphate plots.

On comparing this table with that which exhibits the amounts of water contained in the crops (page 276), it will be seen that the percentage of ash varies very regularly with the percentage of water contained in the bulbs, the rule being that the higher the percentage of water the higher the percentage of ash. There seems to be an intimate relation between these two constituents. It would naturally be expected that plants to whose roots dissolved minerals were applied should be able to absorb more mineral matter than others, but why they should also absorb more water is not quite so apparent. The explanation is probably to be found in osmotic action. The rootlets of plants consist of cells and vessels containing albumenoid matter, and whose delicate walls constitute a fine membrane, permitting of the easy diffusion into them of the crystalloid salts surrounding them in the soil, and it is in great measure to this endosmotic action that the absorption and flow of sap in plants has been ascribed. It follows from this that the amount of water taken up by the roots of plants will be greater in proportion as there is present around their rootlets dilute solutions of crystalloid substances, such as are contained in dissolved manures, and it is probable that the higher percentage of water in the turnips grown with dissolved phosphates is due to this cause. If this explanation is correct we should expect to find that an increase in the proportion of ash should be accompanied by an increase in the proportion of water.

At both stations the amount of mineral matter abstracted from the soil per acre is greater where the dissolved phosphates have been applied, and it would thus appear that the dissolving of phosphates enables the plant to make better use of the mineral food contained in the soil or supplied to it in the manure, and also that farmyard manure, made from the consumption of turnips grown with dissolved phosphates, will be richer in mineral plant food than that made from the consumption of turnips to which undissolved manures had been applied.

We come next to consider the effect produced by various forms of manure upon the amount of albumenoid matter contained in turnips. This is an important inquiry, and one which will receive careful attention in future experiments at our stations. Albumenoid matter is present in small amount in turnips, but it is the constituent of most importance in determining their feeding value, and anything which could be found to increase the

proportion of that constituent would be of immense value to agriculturists. One result of the experiments we are now considering is to show that the proportion of albumenoids in turnips is to some extent influenced by the character of the manures applied to them, and although we must accept with great caution results obtained from an investigation conducted on so small a scale, yet the differences seen, on comparing the percentages of albumenoids, are too marked and regular to be the result of accident. Arranging them as before we have the following :—

HARELAW.

Plots.		Albumenoids in Dried Turnips per cent.		Albumenoids per acre.	
		Insoluble.	Soluble.	Insoluble.	Soluble.
				lbs.	lbs.
1 and 2	Bone ash . .	10·2	9·8	349	322
3 „ 4	Ground coprolites	10·3	9·4	338	319
5 „ 6	Bone dust . .	9·5	9·8	309	273
7 „ 8	Phosphatic guano	10·7	9·9	340	313
9 „ 10	Ground apatite .	11·0	9·5	376	306
	Average .	10·3	9·7	342	307

PUMPHERSTON.

1 and 2	Bone ash . .	7·8	6·0	362	264
3 „ 4	Ground coprolites	6·3	6·0	270	268
5 „ 6	Bone dust . .	7·1	6·0	227	257
7 „ 8	Phosphatic guano	6·2	6·1	272	262
9 „ 10	Ground apatite .	6·8	6·2	250	201
	Average .	6·8	6·2	282	250

We see from these figures that the percentage of albumenoids is smaller on the plots which received dissolved phosphates, and, despite the heavier crop on these plots, the total amount of albumenoids per acre is less on them than on the others. In determining the amount of albumenoids care was taken to separate from the samples all other nitrogenous substances contained in them. Nevertheless it may seem a rash thing to calculate to a pound the amount of albumenoid matter in an acre of turnips from the combustion of a few grains of dried matter derived from a few turnips picked at random over the acre, and so it is. The numbers given cannot be better than rough approximations, but the direction in which they point is at least very decided, and the probabilities are in favour of the position that the proportion

of albumenoids is less in turnips grown with dissolved phosphates, just as the amounts of ash and water are greater. The only other phosphate plots remaining to be noticed are 11 and 12. The former received no phosphates, and the latter bone ash alone. In both cases the result has been a great falling off in the amount of the crop, but the crop on plot 12 was the worst. The great want there was nitrogen, for though potash was also withheld, it will be seen by reference to plots 21 and 22 that the want of potash was very little felt, and that the sole application of potash produced a very poor crop at Harelaw, and the worst crop on the station at Pumpherston.

We come now to consider the results obtained by the application of the various forms of nitrogenous manures. Nitrate of soda and sulphate of ammonia (plots 13 and 14) are seen to be nearly equally effective; the small differences which do exist at both stations are neither well-marked nor regular, and it will be some time before anything definite will be determined from the cropping of these two plots. The land at Harelaw is in high condition, and in consequence the small application of nitrogenous manures has produced scarcely any appreciable effect, plot 17, which got no nitrogen, being quite as productive as the others of the nitrogen series. At Pumpherston the case is different. The want of nitrogen is there clearly shown by the failure of the crop on plot 17, and the still more marked failure of the neighbouring plot (15), which received shoddy, shows that the nitrogen in that manure had not come into operation during the growth of the turnip crop.

The rest of the plots at Pumpherston were so much damaged by the severity of the weather that the amounts obtained on them cannot be compared with those obtained on the other plots which were lifted about two months earlier; and, owing to the unequal manner in which the frost affected various plots, and various parts of them, they cannot even be compared with each other except to a limited extent.

At both stations the crop taken from plot 24 was a small one. Fish guano labours under the disadvantage of containing a certain amount of oil, which protects the decomposition of the manure. The guano here used was dissolved only to a slight extent, so as to make it compare with Peruvian guano. It is probable that, had it been more thoroughly dissolved, fatty matter would have been decomposed, and the action would have been more rapid.

Plot 27, which received no manure, has produced a crop which is not quite the smallest, although it is second lowest on both stations. The results of the superphosphate experiments are not quite satisfactory—the only point in which the two stations agree is in yielding the largest amount of solid matter per acre in the plot which received the superphosphate with 20 per cent

soluble phosphate. It would be premature, however, to conclude from this that dissolving to a greater extent than that does harm rather than good. All we can say is that appearances are in favour of that view.

Regarding the other plots, and the analytical results yielded by them, the less that is said the better. They suffered much at both stations, and their partial investigation was not undertaken with much expectation of their yielding any valuable information. The results tabulated may perhaps be of use hereafter when taken in connection with the results of future crops.

The Barley Crop of 1879.

The station at Pumpherston was the only one that was manured for this crop. That of Harelaw possesses so rich a soil that the application of manure would almost certainly have resulted in the lodging of the crop.

The manures applied were of the same kind as those given to the previous crop of turnips, see page 292, but only half the quantity. They were put on the ground on 19th April under most favourable conditions, and the barley was sown two days thereafter. Meteorological notes were carefully taken during the whole season, and the following is a condensed statement of the main items:—

	Rainfall.		Sunshine.*
	1879.	Probable Yearly Average.	
April (9 days) .	0·34 inches.	1·57 inches.	19 hours.
May . . .	2·09 „	1·91 „	111 „
June . . .	4·93 „	2·42 „	114 „
July . . .	7·30 „	2·53 „	105 „
August . .	3·75 „	2·78 „	115 „
September . .	2·52 „	2·46 „	77 „
	20·94 „	13·67 „	541 „

Temperature (in the shade).

	Highest.	Lowest.	Mean.
May	61°	27°	53°
June	71°	34°	60·6
July	69°	47°	61·3
August . . .	71°	41°	62
September . . .	64°	31·8	58·7

From these figures it will be seen that the season of 1879 is one of the wettest, dullest, coldest seasons on record during recent times. Under such unfavourable conditions the crop matured very slowly. The crop upon the earliest plots was not ready for cutting until 22d September, so that it stood on the ground for fully five months, or about one month longer than the normal period during good seasons in that locality. The latest plots

* Observations of sunshine taken between 6 A.M. and 6 P.M.

were not fit for cutting till about three weeks thereafter. As regards the order of ripening it was noticed that the plots 2, 4, 6, 8, and 10, which had received dissolved phosphates, took the lead of all the rest and were cut in the order stated. After them came the other phosphate plots 1, 3, 5, 7 and 9; then came 26, and by the time it was cut all the plots, except 12 and 18, were ready for the sickle. So gradually did the various plots mature that two men were able to perform the whole operation with the sickle. Plots 12 and 18 were so backward that they had to remain standing several days after all the others were cut down. Fortunately excellent weather set in during September and October so that the whole crop was got in in very good condition. The crop of each plot was stacked on its own ground, and after remaining so for a few weeks the various crops were carried off the ground and thrashed in regular order.

Before giving in detail the results of the cropping, a few observations taken from time to time during the growing season should first be noticed.

The plots with dissolved phosphates were the most forward in brairding, and kept the lead during the whole season. The best coloured and most vigorous were plots 8 and 10. Plots 12, 18, and 20 were the most backward on the station. Plot 18 improved later on, and was remarkable for the darkness of the green colour of its leaf. Plot 13 looked better than 14 during the earlier period of the season, and plots 15 and 16 remained very equal until about the end of July, when the latter gradually gained ground. Plots 19 and 20 were pretty equal, but the former tillered better and looked bulkier though not so tall in the straw as the other. At the end of the season the straw on plot 20 seemed more shapely, and was remarkable for the length of neck between the short blade and the ear. Of the guano plots 23 took the lead and kept it for a long time, but at the end of the season plot 26 looked just about as well. Plot 24 was all along very backward. The unmanured plot was always a poor one, but not so bare as 12 and 18. Plot 29 was markedly the best of the superphosphates during the first half of the season, but latterly plot 30 approached it very closely. The plots with various quantities of manure shewed the difference between the lightly and heavily manured half distinctly from the first, the latter being much the best. Plot 35 was a poor one, and plots 39 and 40 looked about the poorest on the station.

It was noticed that on the dissolved phosphate plots the land was much cleaner than on the others, the more vigorous growth of the crops on these plots tending to discourage the growth of weeds.

The following table exhibits the results obtained when the crops were thrashed out in the month of November:—

BARLEY CROP, PUMPHERSTON, 1879.

	Dressed grain per acre.	Weight per bushel.	Light grain per acre.	Total grain per acre.	Straw per acre.	Weight of 100 straws.
	bushels.	lbs.	lbs.	lbs.	cwts.	
1	31¼	53¾	100	1791	27	1320
2	29¼	53½	120	1688	26	1430
3	29¼	51¾	104	1605	27	1440
4	29¼	53½	88	1650	28	1540
5	21¼	52¼	64	1177	21	1380
6	30	53¾	80	1683	29	1630
7	25⅛	52	76	1386	28	1480
8	28⅛	53¼	80	1600	30	1530
9	22⅝	52	100	1268	24	1720
10	27⅝	53	132	1592	30	1500
11	18⅞	50¾	96	1036	23	1570
12	17⅞	50¼	104	1028	17	1400
13	24	51¼	92	1420	27	1660
14	25⅞	51¾	100	1434	29	1690
15	17⅜	51	104	950	20	1600
16	28⅝	51½	84	1546	29	1670
17	17	51¾	72	952	17	1320
18	20⅜	49¾	124	1139	19	1400
19	30⅞	50½	76	1624	31	1700
20	23½	51½	60	1268	24	1710
21	31¾	48¾	100	1646	29	1640
22	13½	50½	72	756	12	...
23	29⅞	52¾	92	1669	29	1580
24	16¾	53	84	1020	16	1460
25	24⅞	52¾	80	1392	23	1410
26	26⅝	53¼	32	1446	22	1420
27	22½	49¼	52	1163	19	1310
28	22⅓	53¼	40	1237	20	1380
29	28¾	52½	84	1590	28	1520
30	25	53¼	96	1428	24	1500
31 *a*	20½	51	72	1096	20	...
31 *b*	31⅞	52¼	112	1778	32	1680
32 *a*	18¾	52¼	112	1092	20	1540
32 *b*	25¾	51½	96	1420	30	1690
33 *a*	19⅛	52	96	1096	20	1500
33 *b*	32½	51¼	192	1860	32	1590
34 *a*	24	53¼	118	1440	22	1590
34 *b*	26	51½	152	1492	32	1630
35 *a*	21¾	53	96	1296	24	1480
35 *b*	21	53	88	1200	20	1370
39	...	...	...	...	...	1200
40	...	...	...	...	...	

The crop is seen to be a light one, although it was fully better than the average barley crop of the district that season. It ought to be noticed as affecting the weight of the crop that it

suffered severely from a shake during the violent gales of 1st and 22d September, the loss being estimated at 4 bushels per acre, and though the loss was pretty equal over the whole of the plots, yet plots 1, 2, 3 and 4, owing to their proximity to the boundary hedge, suffered rather less than the others.

On arranging the results of the first ten plots as we did for the turnip crop, so as to compare the produce with dissolved and undissolved phosphates, we obtain the following numbers:—

Undissolved Phosphates.

Plots.		Bushels.	Weights per bushel.	Light Grain.	Straw.
			lbs.	lbs.	cwts.
1	Bone ash . .	31¼	53¾	100	27
3	Ground coprolites .	29¼	51¾	104	27
5	Bone dust . .	21¼	52¼	64	21
7	Phosphatic guano .	25⅕	52	76	28
9	Ground apatite .	22½	52	100	24
	Average .	25⅗	52½	88⅘	25¾

Dissolved Phosphates.

Plots.		Bushels.	Weight per bushel.	Light Grain.	Straw.
		lbs.	lbs.	lbs.	cwts.
2	Bone ash . .	29¼	53⅕	120	26
4	Ground coprolites .	29¼	53⅕	88	28
6	Bone dust . .	30	53¾	80	29
8	Phosphatic guano .	28⅕	53¾	80	30
10	Ground apatite .	27½	53	132	30
	Average .	28 9/10	53⅗	100	28⅗

We thus see that the advantage is in favour of the dissolved phosphate in every particular, the increase of dressed grain being about three bushels per acre, a quantity which corresponds to the amount of barley used as seed. But the contrast is made still more striking if we multiply the number of bushels per acre into their weight per bushel, and add their respective weights of light grain. We thus arrive at the numbers contained in the

fourth column, indicating the total weight of grain per acre produced on each plot.

TOTAL WEIGHT OF GRAIN PER ACRE.

Plots.		Undissolved.	Dissolved.
1 and 2	Bone ash	1791	1688
3 „ 4	Ground coprolites . .	1605	1650
5 „ 6	Bone dust	1177	1683
7 „ 8	Phosphatic guano . .	1386	1600
9 „ 10	Ground apatite . . .	1268	1592
	Average . .	1445	1643

We thus see that by simply dissolving the phosphates of the manure the average yield of grain per acre has been increased about 14 per cent.

The weight of straw has also been increased in nearly a corresponding ratio.

A very noteworthy point brought out by these figures is the great regularity of the results obtained on the dissolved phosphate plots, compared with the irregularity in the amounts of crop produced with undissolved phosphates. This gives support to the view that phosphates from whatever source are alike in their effects as manures, so soon as they have been dissolved. In their undissolved state their efficacy is influenced by various circumstances, such as the fineness of their state of division, their hardness and resistance to chemical action, or the presence of fatty matter, which protects the phosphates from the action of water, and so tends to retard their decomposition in the soil. It is no doubt partly due to this last characteristic that bone dust undissolved forms so inactive a manure.

The want of phosphates, as seen by plot 11, has been followed by a diminution in grain, and especially in the quality of the grain, but it has had comparatively little influence on the produce of straw. The sole application of phosphates has failed to produce a good crop of straw, and this is no doubt due to the absence of nitrogen, as seen from the yield of straw in plot 17 from which nitrogen was withheld. The want of potash has probably nothing to do with it, for we find on plot 22 that where potash alone was applied the crop was a signal failure.

Of the two most common forms of nitrogenous manure, nitrate of soda and sulphate of ammonia, the latter has a slight advantage,

although when growing it seemed as if the nitrate had it. It is possible that the excessive wetness of the season may have injuriously affected the nitrate plot by carrying some of the salt below the level of the roots.

The failure of shoddy as a nitrogenous manure has been very marked in both the turnip and the barley crop. It is evident that shoddy in its natural state is not a suitable manure. If dissolved with sulphuric acid, which would greatly reduce its bulk and destroy the greasy matter with which it is impregnated, it would no doubt be a much more active manure. Dried blood (plot 16) has yielded a fair crop, but it would also be much improved by a similar treatment. On plot 17 the want of nitrogen is very apparent, and on plot 18 there is shown the want of phosphoric acid. The result of applying nitrate of soda, where the soil is poor in mineral food, is to produce a poor quality of grain and greatly to increase the proportion of light grain. A comparison of plots 19 and 20 seems to show that sulphate of potash is superior to muriate, but it is probable that the superiority is by no means so great as here indicated, for the former gives a result rather higher than its duplicate (13), and the latter a result rather lower than its duplicate (34 *a*, *b*), while on the other station the yield in 19 and 20 is nearly the same. The want of potash on Pumpherston seems to be very little felt, for plot 21, which got none, has produced an excellent crop, while plot 22, which received sulphate of potash alone, seems to have been considerably the worse for it.

Of the guano plots No. 23, which received Peruvian guano, is much the best. It was a very even and handsome crop as it stood ripe on the ground, the length and shape of the straw and the colour of the grain being much admired by visitors to the station. Fish guano failed although it was a well-made manure, and that no doubt on account of the large percentage of oil contained in it. The disadvantage of oil in manures deserves the careful attention of manure manufacturers, for there is no doubt that its extraction, if it could be done profitably or at small cost, would greatly enhance the value of this very important and unfailing source of phosphatic manure. Ichaboe guano (plot 25) has not realized the hopes entertained of it. It is a highly nitrogenous manure, but the nitrogen is present in a form difficult to decompose, much of it being in the feathers which abound in that manure, and which remain in the soil undecomposed for many months. This no doubt is another form of manure which would be greatly improved by being dissolved.

The imitation guano in plot 26 was made of bone ash, dried blood, and rape cake, dissolved so as to contain 10 per cent. soluble phosphate after the addition of a small proportion of

nitrate of soda and potash salts. It was as nearly as possible an imitation of Peruvian guano, and it produced a fairly good crop. The unmanured plot (27) is not the poorest on the station, as one would have expected, though probably it is a mistake in such a series of experiments to expect it, as certain kinds of manurial interference may easily do more harm than good, but it is sufficiently poor to show that the soil on the station is a poor one, and well suited for experiment.

The next three plots are intended to give some information as to the extent to which it is expedient to dissolve phosphates, and, so far as the experiment has yet gone, the indications given seem to favour the opinion that there is a limit beyond which it is inexpedient to dissolve phosphates, if intended to be applied to the soil unaccompanied by other undissolved phosphatic manure. But it may be said of this experiment, as of almost every other on the station, that it is not yet so far advanced as to yield any precise information.

The experiments which follow to test the efficacy of some of the manures selected from other plots on the station, when applied in quantities half as much and double as much as are applied to the original plots, are of interest, chiefly in reference to the needs of the particular soil of the station itself; but as each of these plots receives the same total amount of manure, though differently distributed, it serves as a check upon the plot of which it is a duplicate. It will be some time before definite practical information can be obtained from the cropping in these plots.

On comparing the produce of the barley crop with that of the preceding crop of turnips, it will be seen that the differences in the amounts of grain produced on the various plots do not always correspond with the differences in the weights of turnips. The weights of straw, however, correspond with these in their increase and decrease much more closely, and this is what we ought to expect when we consider that the straw of barley is that part of the crop which corresponds in great measure to the bulb of the turnip, which is a swollen stem producing buds and leaves from its upper surface, and genuine roots from its lower surface.

Accordingly, we find that those forms of manure which favour the growth of bulbs in the turnip crop also tend to increase the amount of straw in the cereal crop.

In the last column of the table are a series of numbers indicating the weight of 100 straws, picked one by one at random from the samples sent in—each sample itself consisting of small handfuls taken from time to time during the threshing. These hundred straws were selected for analysis, but it was thought that their weights, when taken in connection with the total

yield, might give some indication of the fineness of the straw. Duplicate hundreds taken from several lots have shown, however, that the weights of these may vary considerably, and that 1000 straws per sample would be needed to give approximately correct values, and that the entire process of sampling straw would require to be done on a much larger scale.

The $\frac{1}{2}$th acre plots on this station have now been put into a satisfactory state. The whole soil of plot 36 has now been lifted and mixed together, the subsoil has been stirred, and the whole regularly drained, and the soil respread so as to make a uniform piece of land, which will contain duplicates of the first 22 plots, and which may be expected to produce results as far as possible reliable.

The analysis of the barley crop at Pumpherston, though far advanced, will not be completed for two months, and though some of the results obtained might be discussed here, it has been thought more profitable and expedient to delay their consideration till the completed results are able to be produced, and viewed as a whole. We shall now notice shortly the results of the barley crop at Harelaw.

The Barley Crop at Harelaw, 1879.

As was noticed at the beginning of this report, the station at Harelaw was not manured for the barley crop. The land is in high condition, and is, on that account, not so well suited for experimental purposes as the land at Pumpherston. Nevertheless, it is satisfactory to observe that the effects of the manures applied for the Swedes in 1878 are quite visible on the returns obtained with the succeeding crop of barley, and a few observations regarding these may not be without interest.

If the crops of barley are compared with the former crops of turnips on the same plots, a compensatory result will frequently be noticed. Plots which yielded a poor crop of turnips have, in many cases, yielded a fair crop of grain. For example, plot 5, which was the poorest of the phosphate plots when under turnips, has grown the best crop of barley. There are several causes at work to produce this result. In the first place, the soil which carried a large crop of turnips parted with a correspondingly large amount of its available nourishment, and left less for the succeeding crop; in the second place, on those plots which received slow acting manures, a considerable part of the manure was not able to be utilised by the turnip crop, and thus became available for the barley.

The following table gives the results of the crop :—

	Rood Plots.					$\frac{1}{112}$ Acre Plots.			
	Dressed Grain per acre.	Weight per bushel.	Light Grain.	Total Grain per acre.	Straw.	Dressed Grain per plot.	Light Grain.	Total Grain per acre.	Straw.
	bushels.	lbs.	lbs.	lbs.	cwts.	lbs.	lbs.	lbs.	cwts.
1	35·3	54	168	2074	30	12	$\frac{1}{2}$	1400	25
2	37·3	54	304	2320	36	16	$\frac{3}{4}$	1876	26
3	39	54	156	2260	32	18	1	2128	28
4	37	54	160	2156	34	16	1	1940	28
5	43·5	$53\frac{1}{2}$	136	2468	32	15	1	1792	30
6	41·3	$53\frac{1}{4}$	116	2332	36	20	$\frac{3}{4}$	2324	$32\frac{1}{2}$
7	43·2	$52\frac{3}{4}$	156	2432	32	17	1	2016	32
8	41·2	53	152	2332	36	18	1	2128	34
9	38·2	$53\frac{1}{2}$	176	2224	30	19	1	2240	32
10	43·6	$53\frac{1}{4}$	92	2402	36	19	1	2240	35
11	37·8	$53\frac{3}{4}$	112	2147	34	22	$\frac{1}{2}$	2520	35
12	39·1	$53\frac{1}{4}$	176	2260	30	21	$1\frac{1}{2}$	2520	39
13	40·5	$53\frac{3}{4}$	144	2318	36	18	1	2128	36
14	40·7	$53\frac{3}{4}$	136	2328	30	21	$1\frac{1}{2}$	2520	36
15	36	$53\frac{3}{4}$	144	2079	34	21	$1\frac{3}{4}$	2548	39
16	38·4	$53\frac{3}{4}$	168	2230	32	22	1	2576	36
17	36·4	54	116	2084	30	22	1	2576	36
18	40·9	$53\frac{1}{2}$	156	2344	36	20	1	2352	33
19	37·5	54	112	2136	30	18	1	2128	34
20	36·5	54	100	2072	32	16	1	1940	31
21	39·4	$53\frac{1}{4}$	138	2200	36	22	1	2576	36
22	36·7	$53\frac{3}{4}$	88	2060	30	21	1	2464	33
23	41·4	$53\frac{1}{2}$	112	2324	34				
24	38	53	108	2128	30				
25	39	53	106	2230	34				
26	36	$53\frac{1}{2}$	128	2048	36				
27	39·8	$53\frac{1}{4}$	120	2200	34	18	2	2240	31
28	36	$53\frac{3}{4}$	64	2000	32				
29	38	$53\frac{1}{4}$	140	2156	34				
30	35·3	54	168	2076	32				
31 *a*	48·8	$53\frac{3}{4}$	128	2623	32				
31 *b*	39	$53\frac{3}{4}$	128	2096	24				
32 *a*	38·6	$53\frac{3}{4}$	88	2074	24				
32 *b*	41	54	112	2214	32				
33 *a*	34·8	$53\frac{3}{4}$	104	1870	24				
33 *b*	42·2	$53\frac{3}{4}$	88	2268	22				
34 *a*	39·5	$53\frac{1}{2}$	136	2113	24				
34 *b*	35·6	$53\frac{3}{4}$	120	1913	32				
35 *a*	39	$52\frac{3}{4}$	128	2057	24				
35 *b*	47	$53\frac{1}{2}$	186	2479	32				
38 *a*	51	$53\frac{3}{4}$	136	1958	24				
38 *b*	33·5	$54\frac{1}{4}$	104	1217	26				

Again, it is well known that different crops find their nourishment at different depths in the soil. Of the two crops we are considering, the turnip, during its later growth, sends its roots down deep into the soil, while barley lives more on the surface, and when, in addition to these circumstances, we consider that the wants of one crop are not quite the same as those of another, we must be prepared to find considerable discrepancies in the returns yielded by the same plots in different seasons, whether the manuring has been continued or interrupted.

The plots with dissolved phosphates scarcely show any superiority over those with undissolved phosphates as regards the yield of grain, though the straw of the latter has still the advantage in every instance. Where nitrogenous manures have been withheld, the yield of straw has been diminished more than the yield of grain. Nitrate of soda has produced the same amount of grain as sulphate of ammonia, but a much larger return of straw. Sulphate of potash has produced a slightly larger yield of grain, and slightly smaller yield of straw than the muriate of potash. A considerable residue of the Peruvian guano seems to have remained for the use of the barley crop, and the fish guano plot has also improved its position, but the produce of straw in all the guano plots have not changed their relative position.

Regarding the $\frac{1}{1}\frac{1}{2}$ acre plots, very little can be said. They cannot be said to corroborate the results obtained on the rood plots, and we must wait for the evidence of future crops before we are able to pass an opinion upon their competency, to be considered checks upon the accuracy of the results obtained upon the plots of which they are duplicates.

Scheme of Experiments at the Experimental Agricultural Stations of the Highland and Agricultural Society of Scotland, commenced May 1878.

At each station there are 10 acres under experiment, divided into 40 plots of 1 rood each. The cropping is a rotation of turnips, barley, grass, and oats. The chief object of the experiments is to determine the crop-producing value of the various forms of the most important manures. The manures on each plot contain 40 lbs. phosphoric acid, 30 lbs. potash, 10 lbs. nitrogen, or half these quantities.

Plot.

PHOSPHATIC MANURES.

1. Bone Ash, . . . with Sulphate of Potash. Nitrate of Soda.
2. do. dissolved, . . ,, Muriate ,, ,,
3. Ground Coprolites, . . ,, Sulphate ,, ,,
4. ,, dissolved, . ,, Muriate ,, ,,
5. Bone Dust, . . . ,, Sulphate ,, ,,
6. do. dissolved, . . ,, Muriate ,, ,,
7. Phosphatic Guano . . ,, Sulphate ,, ,,
8. do. dissolved, . ,, Muriate ,, ,,
9. Ground Apatite, . . . ,, Sulphate ,, ,,
10. do. dissolved, . ,, Muriate ,, ,,
11. No Phosphates, . . . ,, Sulphate ,, ,,
12. Bone Ash alone.

NITROGENOUS MANURES.

13. Nitrate of Soda, . . . with Bone Ash. Sulphate of Potash.
14. Sulphate of Ammonia, . . ,, ,, Muriate ,,
15. Shoddy, ... ,, ,, Sulphate ,,
16. Dried Blood, . . . ,, ,, ,, ,,
17. No Nitrogen, . . . ,, ,, ,, ,,
18. Nitrate of Soda alone.

Rape Cake and Cotton Cake, see Plot 35.

POTASH MANURES.

19. Sulphate of Potash, . . with Nitrate of Soda. Bone Ash.
20. Muriate ,, . . ,, ,, ,,
21. No Potash, . . . ,, ,, ,,
22. Sulphate of Potash alone.

GUANOS.

23. Peruvian Guano, } with Bone Ash and Sulphate of Potash. { Containing about 10 % Ammonia and 10 % soluble Phosphate.
24. Fish ,, }
25. Ichaboe ,, }
26. Imitation ,, }

27. Unmanured.

SUPERPHOSPHATES.

28. 10 % Soluble Phosphate of Lime. Sulphate of Ammonia. Muriate of Potash.
29. 20 % ,, ,, ,, ,,
30. 30 % ,, ,, ,, ,,

VARIOUS QUANTITIES.

31. Same as Plot 1. { *a.* $\frac{2}{3}$ quantity per acre. { *b.* $1\frac{1}{3}$,,
32. ,, ,, 2. { *a.* $\frac{2}{3}$,, { *b.* $1\frac{1}{3}$,,
33. ,, ,, 14. { *a.* $\frac{2}{3}$,, { *b.* $1\frac{1}{3}$,,
34. ,, ,, 20. { *a.* $\frac{2}{3}$,, { *b.* $1\frac{1}{3}$,,
35. { *a.* Rape Seed Dust. { *b.* Decorticated Cotton Cake.
36. Duplicates of Plots 1 to 22 each $1\frac{1}{2}$ acre.
37. Analytical Plot:
    1. Full Manure.
    2. Without Phosphoric Acid.
    3. ,, Nitrogen.
    4. ,, Potash.
    5. Without Lime.
    6. ,, Magnesia.
    7. ,, Sulphuric Acid.
    8. Unmanured.
38. Sulphuric Acid, and Sulphate of Lime. { *a.* 1 cwt. { *b.* 2 cwt.
39. } Continuous white crops.
40. }

Weight of Manures applied to Plots.*

Plots.	Bone Ash.	Ground Coprolites.	Bone Dust.	Phosphatic Guano.	Ground Apatite.	Nitrate of Soda.	Sulphate of Ammonia.	Shoddy.	Dried Blood.	Sulphate of Potash.	Chloride of Potassium.	Peruvian Guano.	Fish Guano.	Ichaboe Guano.	Sulphuric Acid.	Rape Dust.	Cotton-cake Dust.	Total weight of Manure per Acre.	
	lbs.																	cwts.	lbs.
1	111	...	...	...	...	64	...	...	...	93	...	...	...	...	...	...	...	9	64
2	111	...	...	...	...	64	...	...	...	...	78	...	...	...	87	...	...	12	16
3	...	155	...	...	...	64	...	...	...	93	...	...	...	...	...	...	...	11	16
4	...	155	...	...	...	64	...	...	...	...	78	...	...	...	95	...	...	14	0
5	...	...	163	...	...	28	...	...	...	93	...	...	...	...	...	...	...	10	16
6	...	...	163	...	...	28	...	...	...	...	78	...	...	...	81	...	...	12	56
7	...	...	...	116	...	64	...	...	...	93	...	...	...	...	...	...	...	9	84
8	...	...	...	116	...	64	...	...	...	...	78	...	...	...	58	...	...	11	32
9	...	...	...	...	104	64	...	...	...	93	...	...	...	...	...	...	...	9	36
10	...	...	...	...	104	64	...	...	...	...	78	...	...	...	64	...	...	11	8
11	...	...	...	...	...	64	...	...	...	93	...	...	...	...	...	...	...	5	68
12	111	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	108
13	111	...	...	...	...	64	...	...	...	93	...	...	...	...	...	...	...	9	64
14	111	...	...	...	...	...	50	...	...	...	78	...	...	...	...	...	...	8	60
15	111	...	...	...	...	...	...	122	...	93	...	...	...	...	...	...	...	11	72
16	111	...	...	...	...	...	...	...	97	93	...	...	...	...	...	...	...	10	84
17	111	...	...	...	...	...	...	...	...	93	...	...	...	...	...	...	...	7	22
18	...	...	...	...	...	64	...	...	...	...	...	...	...	...	...	...	...	2	32
19	111	...	...	...	...	64	...	...	...	93	...	...	...	...	...	...	...	9	64
20	111	...	...	...	...	64	...	...	...	...	78	...	...	...	...	...	...	9	4
21	111	...	...	...	...	64	...	...	...	...	...	...	...	...	...	...	...	6	28
22	...	...	...	...	...	...	...	...	...	93	...	...	...	...	...	...	...	3	36
23	57	...	...	...	...	...	...	...	...	73	...	128	...	...	...	...	...	9	24
24	...	...	...	...	...	...	...	...	...	78	...	...	117	...	40	...	...	9	80
25	...	...	...	...	...	...	...	...	...	78	...	...	...	93	...	...	...	9	32
26	111	...	...	...	...	13	...	...	17	47	39	...	...	...	100	50	...	13	52
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	111	...	...	...	...	...	50	...	...	...	78	...	...	...	36	...	...	9	92
29	111	...	...	...	...	...	50	...	...	...	78	...	...	...	72	...	...	11	12
30	111	...	...	...	...	...	50	...	...	...	78	...	...	...	108	...	...	12	44
31 a	37	...	...	...	...	21	...	...	...	31	...	...	...	...	...	...	...	6	43
31 b	74	...	...	...	...	43	...	...	...	62	...	...	...	...	...	...	...	12	86
32 a	37	...	...	...	...	21	...	...	...	...	26	...	...	...	29	...	...	8	10
32 b	74	...	...	...	...	43	...	...	...	...	52	...	...	...	58	...	...	16	20
33 a	37	...	...	...	...	...	...	...	...	...	26	...	...	...	...	...	...	5	76
33 b	74	...	...	...	...	...	...	...	...	...	52	...	...	...	...	...	...	11	40
34 a	37	...	...	...	...	21	...	...	...	...	26	...	...	...	...	...	...	6	3
34 b	74	...	...	...	...	43	...	...	...	...	52	...	...	...	...	...	...	12	6
35 a	49	...	...	...	...	...	...	...	...	46	...	...	...	...	...	125	...	15	0
35 b	56	...	...	...	...	...	...	...	...	46	...	...	...	...	...	...	84	13	32

* The weights given are those applied to the turnip crop. The other crops receive exactly half these weights.

DUPLICATE EXPERIMENTS AT YESTER MAINS.

It is one of the defects of the system of cropping in use at the Society's stations, that all the plots at both stations are under the same crop each year, so that four years must elapse before experiments with any one crop are able to be repeated. The disadvantage of this arrangement has been very apparent during the last two seasons, which have been unpropitious for the crops grown on them. Had the stations been larger or the experiments less extensive, each of the four crops of the rotation might have been grown annually, and thus have rendered the success of the experiments less dependent on weather conditions. It is probable that some means of obviating this defect will be adopted hereafter, for some of the questions that have arisen from the results of the turnip crop are too important to be allowed to lie over in the hope of obtaining a propitious season once every four years. The Marquis of Tweeddale has kindly come to the aid of the Society in this matter, and has repeated on the farm of Yester Mains six experiments selected from the phosphate plots. The soil chosen for the experiments is a sandy clay in fair condition, and the experiments are duplicates of plots 3 and 4, 5 and 6, and 9 and 10 of the Society's scheme, thus enabling both dissolved and undissolved phosphate from animal and mineral origin to be compared.

The crop was yellow turnips, "Fosterton hybrid," but owing to the unfortunate season only about half the average yield was obtained. The following are the results per acre :—

Plot.	tons.	cwts.	qrs.	lbs.
3. Ground coprolites, .	4	0	2	18
4. Do. dissolved,	8	1	1	8
5. Bone ash, . . .	5	7	2	6
6. Do. dissolved, .	9	8	0	24
9. Ground apatite, . .	7	1	0	18
10. Do. dissolved,	9	8	0	24

The advantage is seen to be greatly in favour of the dissolved manures. It is remarkable that the crops obtained with dissolved bones and dissolved apatite should be so exactly equal, but they differed somewhat in appearance; the latter were fewer in number but correspondingly larger, a circumstance which may be explained by the fact that the "fly" destroyed a large number of the young plants, and thus gave the others more room to grow and more nourishment to absorb.

At the beginning of the season plot 6 looked the best, but it did not improve so well as plot 10. In this respect they differed from those grown at the Society's stations.

The experiments are under the care of Mr Swinton, to whom I am indebted for the data here given. The samples taken from these plots have not yet been analysed, but will form part of

next year's report, accompanied probably with the results of a second crop, for it is gratifying to know that it is the intention of the Marquis of Tweeddale to continue the experiments.

EXPERIMENTS ON THE GROWTH OF BARLEY GROWN IN POTS UNDER GLASS, BEING A DUPLICATE OF THE HIGHLAND AND AGRICULTURAL SOCIETY'S FIELD EXPERIMENTS.

When everything has been done that care and attention can secure and experience suggest in the conduct of field experiments, there still remain many disturbing influences beyond the control of the experimenter, which, if they do not defeat his aims, at least greatly retard his progress. These are mainly the influences of weather and season, and it was to eliminate these, and so form a check upon the results obtained at the Society's stations, that the experiments here described were undertaken. The soil used was a very poor one, and it was worked together with the spade, and twice riddled before it was put into the pots. The pots were bags made of stout canvass, about 10 inches in diameter, and 15 inches deep, and the same weight of soil was put into each. The object in using canvas bags was to overcome some serious obstacles which ordinary clay pots present to the attainment of accurate results in the carrying out of comparative manurial experiments. It is well known to gardeners that common garden pots differ greatly in thickness, porosity, and composition, and that these differences affect the growth of the plants they contain. The more porous kinds of clay permit of greater æration of the roots, more rapid drainage and evaporation at the external surface, and consequently require more frequent watering. The temperature of the earth in them is also affected by the porosity of the pot, the more rapid evaporation determining an amelioration of temperature. The substance of the clay itself is not unaffected by the roots of plants, and some kinds and textures of clay are more easily acted on than others.

In experiments where the effect of a few grains of manure is to be noted, such differences as these may be very disturbing; but the most serious objection is one which is common to all clay pots, and is most conspicuous in the best of them. It is a matter of common observation that the outside of these pots becomes covered over with a white incrustation. This consists, for the most part, of salts which have been dissolved out of the earth and the clay of the pot, and which have been left behind when the water which held them in solution was evaporated at the surface. It is noticed chiefly on parts of the pots exposed to free air or the sun's rays, and, as the salts forming it are part of the food of plants, they are by this process carried out of reach of the rootlets. The extent to which this goes on depends, among

other things, upon the solubility of the salts in the soil, and it takes place more rapidly in pots containing soluble manures.

By the use of canvas bags all these inconveniences are avoided; the salts do come to the outside in some measure, but the rootlets come out in search of them. Their great porosity favours the aeration of the soil, and their thinness causes them to be moistened immediately when the earth is watered, and so permits of the watering being conducted with great equalness and precision. The bags were placed in clay flats which, during the whole course of the experiments, were scarcely ever wetted. The manures, of the same kind and amount per acre as those used in the Society's experiments, were mixed into the upper 4 or 5 inches of soil, and the barley was sown at an equal depth in all the bags. Great care was exercised in choosing the seed, so as to prevent the occurrence of any differences in the crop due to unequal seeding. The method adopted was the following:—The barley was first steeped in water, and all that floated was thrown away. Thereafter sugar was added to the water till a thick syrup was formed, in which about three-fourths of the residue floated. This also was set aside, and the fourth part, which remained and constituted the heaviest of the barley, was kept for seed. It was washed and spread out, and separated as nearly as possible into large and small grains. The large grains were selected for the experiments. The pots, forty in number, were arranged on a table in the centre of a green-house, and their relative positions were changed from time to time so as to secure as equal an exposure as possible to all the pots. There was an abundant supply of air admitted during the whole season, and care was taken in the watering of the pots that each should get just as much water as it required, those on which the growth was luxuriant requiring, on account of the large amount of transpiration at the leaves, much more water than the others. Owing to the height of the house, and the abundance of light and air, the crops were scarcely at all *drawn up*, and, at the end of the growing season, the crop presented a very natural appearance. In each of the forty pots fifteen seeds were sown on the 16th May, and nearly every seed germinated. When the braird was 6 inches high the less vigorous plants were plucked out, leaving ten plants in each pot. From the time that the plants were 1 inch high until they attained the height of 2 feet, clear drops of liquid, which would be called dew-drops, formed regularly on certain parts of the leaves, usually at the ends. These were exudations of the plant, for, when collected and carefully evaporated, there was left behind a residue which, on being examined by the microscope, was found to consist of beautiful crystals. The following table exhibits the results of these experiments:—

EXPERIMENTS WITH BARLEY GROWN IN POTS UNDER GLASS
(10 SEEDS IN EACH POT).

	Number of Barley Corns.	Weight of Grain.	Average weight per Grain.	Number of Straws.		Weight of Straw.	Average weight per Straw.	Awns.
				Matured.	Unmatured.			
		grains.	grains.			grains.	grains.	grains.
1	293	226	·771	13	...	400	30·8	32
2	589	442	·750	24	...	530	22·1	55
3	250	202	·801	11	...	490	44·5	29
4	382	302	·791	20	2	600	30	41
5	271	208	·767	13	...	410	31·4	28
6	452	335	·741	25	3	610	24·4	47
7	329	249	·757	16	...	470	29·4	34
8	499	390	·781	23	1	660	28·7	49
9	249	195	·783	13	...	410	31·4	26
10	424	343	·809	19	...	700	37	45
11	216	182	·842	10	...	400	40	25
12	128	92	·719	10	...	180	18	13
13	244	201	·824	13	1	460	35·4	28
14	348	289	·830	16	...	570	35·6	37
15	132	93	·704	10	...	200	20	13
16	164	133	·881	10	1	360	36	17
17	141	99	·702	10	...	210	21	13
18	215	179	·832	10	...	400	40	23
19	195	163	·836	10	1	370	37	20
20	354	275	·777	18	1	435	24·1	34
21	230	182	·793	11	...	370	33·6	27
22	140	99	·705	...	...	...	...	14
23	247	204	·815	13	1	400	30·8	26
24	180	140	·776	9	...	270	30	27
25	197	161	·818	9	...	360	31·1	19
26	178	152	·855	9	1	280	31·1	19
27	184	146	·791	10	...	240	24	18
28	458	403	·880	21	...	600	28·6	50
29	431	367	·805	20	...	600	30	46
30	376	320	·867	17	...	560	33	42
31 *a*	175	138	·786	10	...	320	32	16
31 *b*	394	304	·772	17	1	530	31·2	34
32 *a*	242	215	·886	11	...	360	32·7	27
32 *b*	700	560	·800	27	1	580	21·5	60
33 *a*	226	187	·825	13	1	350	27	20
33 *b*	684	568	·815	32	2	710	22·2	78
34 *a*	192	163	·850	10	1	320	32·2	24
34 *b*	630	522	·829	34	7	840	24·7	63
35	90	64	·707	10	1	130	13	10
36	73	54	·745	10	1	110	11	10
37	644	517	·802	27	...	815	30·2	62

The pots were numbered in the same manner as the field plots, and notes were taken periodically during the growing season. The pots with dissolved phosphates were of a darker

green and more vigorous growth than the others. After about two months the pots with undissolved phosphates began to turn yellow in the lower leaves, which soon began to shrivel up, showing that the nourishment in them was being reabsorbed and made use of further up the plant where the growth was going on. This is a sure sign of defective nutrition, for not until the supply at the roots is inadequate does the plant begin to use up the reserve of nourishment contained in the less useful parts of its own organism. Those which received dissolved manures and increased amounts of manure did not show that tendency till some weeks later. As the experiment proceeded, the differences exhibited by the various pots were very striking. From the ten seeds there grew up in some cases upwards of thirty straws, while in others the number was limited to the original ten, and in a few instances one of the ten did not mature. In height and calibre of straw, also, some plots were double others. The crop was allowed to stand until it was dead ripe, and it was cut down on 10th September. The straw was cut about an inch from the earth, and the grain was carefully removed with the hand. It was thereafter taken to the laboratory, dried at 100° C. and weighed. The number of barley corns in each was counted, and the dried straws were also counted and weighed.

A glance at the numbers on the above table show that the soil selected for the experiments was well-adapted to exhibit the efficacy of the manures applied. The number of grains range from about 100 to upwards of 600, and the weights of these show a corresponding difference. The number of straws range from nine to more than thirty, and their weights differ still more widely. On comparing the returns of the first ten plots we obtain the following numbers:—

Phosphate Plots.

	Number of Grains.		Weight of Grains.		Number of Straws.		Weight of Straws.	
	Undissolved.	Dissolved.	Undissolved.	Dissolved.	Undissolved.	Dissolved.	Undissolved.	Dissolved.
			grs.	grs.			grs.	grs.
Bone ash . . .	293	589	226	442	13	24	400	530
Ground coprolites .	250	382	202	302	11	20	490	600
Bone dust . . .	271	452	208	335	13	25	410	600
Phosphatic guano .	329	499	249	390	16	23	420	660
Apatite . . .	249	424	195	343	13	19	410	700
Average . .	278	469	216	362	13	22	426	618

The pots with dissolved phosphates have, roughly speaking, produced half as much again as the others.

The weight per bushel is an important item in grain crops, and though with such small quantities as those before us we cannot estimate this, yet, by dividing the weights obtained by the numbers of grains and straws respectively, we obtain the average weight per grain and per straw. These are given in the third and sixth columns. They are seen to differ considerably, but the differences are somewhat irregular, and, on the average, the weight per grain of the barley grown with dissolved and undissolved manures is the same. The weight per straw is greater in the undissolved pots in every instance, and is, on the average, 33½ grains; that of the straw grown with dissolved manures being only 28½ grains. The action of dissolved phosphates is thus seen to have the twofold advantage of greatly increasing the amount of straw, and also of rendering it lighter and therefore more useful both for fodder and litter.

The straw on pot 2 was especially remarkable for its lightness and beauty. It was quite as long and thick as that on pot 3, but each straw weighed only about half as much.

It is possible that the great differences observed in the amount and character of the straw on the dissolved and undissolved phosphate pots may be partially due to the muriatic acid present in the manure of the former. The results obtained in pots 19 and 20 seem to favour that supposition; but, on the other hand, pots 2 and 20 differing only as regards the solubility of the phosphates, the superiority of the former must, in great measure, be attributed to the sole effect of the dissolved phosphates. In order to settle that point, I have this season laid down a new set of pot experiments with a large number of duplicates. The soil is the same, but much greater care has been bestowed on the mixing, the whole having been worked in with the spade and riddled six times.

Pots 12, 17, and 22 all agree in having had no nitrogen applied to them, and the result is the production of very poor crops. Nitrogenous manures are what the soil stands most in need of, and the sole application of nitrate of soda on pot 18 produced a fair crop.

Nitrate of soda (13) has not succeeded so well as sulphate of ammonia (14).

Here, again, No. 15 is the most backward, and 16, though producing strong heavy straw, does not compare favourably with 13 and 14.

The difference between pots 19 and 20 is so marked that I am led to suspect that there must have been some accidental cause operating to account for it.

As regards the guanos, No. 23, Peruvian guano, is clearly

ahead of the others. Fish guano labours under the same disadvantage as pots 5, 15, and 16; it contains a considerable amount of fatty matter which resists decomposition in the soil, and retards the action of the manure.

Of the superphosphates, that containing 10 per cent. soluble phosphate has done best, and the further increase of dissolved phosphates has still further reduced the crop.

The great advantage of heavy manuring to a poor soil is seen in pots (*b*) of the next four numbers.

Pot 35 received nothing but sulphuric acid, which was well incorporated with the upper half of the soil, and the amount given was the same as that used for dissolving the phosphates in plot 30. The result is seen to be a failure. Pot 36 is unmanured soil in which light seed was sown. The miserable result obtained shows the importance of selecting for seed only the heaviest grain. Pot 37 is an odd one which contained rich garden soil, and which was set down as a base for comparing the fertility of the other pots; only the heaviest manured pots have been able to compete with it.

Pot 27, which received no manure, has produced a crop better than some of those which received partial manures. This is an experience not unfrequently met with, and in this case I suppose it must be the result of some superiority in the soil. The means adopted for mixing the soil may not have been thorough enough, and more care will in future experiments be paid to that matter.

An attempt was made to estimate the amount of root growth made in the various pots, but it was not found possible to separate the fine rootlets from the earth without considerable loss. So far as could be noticed, however, the amount of roots was in general proportionate to the luxuriance of growth of the straw.

The results of this carefully carried out series of experiments has been to corroborate, in most particulars, those obtained with the same manures at Pumpherston station.

For the success of this series of experiments I am much indebted to Mr Thomas Whyte, Liberton, who watched and tended the pots with the utmost care.

INSTRUCTIONS FOR SELECTING SAMPLES FOR ANALYSIS.

Manures.—About half a dozen bags should be chosen for sampling. Each bag should be emptied out separately on a clean floor, worked through with a spade, and one spadeful taken out. The five or six spadefuls thus selected should be mixed together until a uniform mixture is obtained. Of this mixture one spadeful should be taken, spread on paper, and still more thoroughly mixed; any lumps which it may contain being broken down with the hand. About half a pound of this mixture should be sent for analysis in an air-tight box to prevent its gaining or losing moisture. Should there be large hard lumps or stones present, five or six pounds are required for analysis.

N.B.—This should be done in the presence of a reliable witness. Two samples should be taken and sealed, the one sent on and the other retained for reference in case of dispute.

Feeding Mixtures.—These should be sampled in a similar manner.

Feeding Cakes.—A cake should be broken across the middle, and, from the break, a piece should be taken across the entire breadth of the cake and sent for analysis. The rest of the cake should be kept for reference.

Soils.—Dig a little trench about two feet deep, exposing the soil and subsoil. Cut from the side of this trench a perpendicular section of the soil down to the top of the subsoil, and about four inches wide. Extract it carefully, and do not allow the subsoil to mix with it. A similar section of subsoil immediately below this sample should be taken and preserved separately. Five or six similarly drawn samples should be taken from different parts of the field, and kept separate while being sent to the chemist, that he may examine them individually before mixing in the laboratory.

Waters.—The bottles or jars in which samples of water are sent should be thoroughly cleaned. This is done by first rinsing them with water, then with a little oil of vitrol. After pouring this out the bottle should be rinsed six times with water, filled, corked with a new washed cork, sealed, and sent *without delay*. (Chemically clean bottles may be had at the laboratory.) Well water may be collected at any time, but it should be allowed to run for some time before the sample is taken. Spring or stream water should be collected when the weather is dry. In the analysis of a mineral water it may sometimes be desirable to determine the amount of gases held in solution, in which case certain precautions must be observed which require the presence of the chemist at the spring.

Scale of Fees.

Manures,	£1	0	0
Feeding Stuffs,	1	0	0
Water, Sanitary Analysis,	1	0	0
„ Full Analysis,	5	0	0
Soil, Analytical Examination and Recommendation of Manures,	1	10	0
„ Full Analysis,	5	0	0
Partial Analysis, each constituent,	0	10	0
Testing for Gross Adulteration,	0	5	0
Advice,	0	5	0

Interpretation of Analyses.

The following notes will be found useful in enabling those unacquainted with chemistry to interpret analytical reports :—

I. MANURES.

The three items of greatest importance in manures are phosphoric acid, nitrogen, and potash.

(1.) PHOSPHORIC ACID is present in manures as such, and also as phosphates of lime, magnesia, iron, and alumina.

Phosphate of lime is most important, and exists in two states, insoluble and soluble.

Insoluble—Insoluble phosphate of lime, called Tricalcic phosphate, and Tribasic phosphate of lime, } contains about 46 % phosphoric acid.

Soluble—Soluble phosphate of lime, called Acid phosphate of lime, } contains about 61 % phosphoric acid.

Some analysts prefer to state the soluble phosphate as,

Biphosphate of lime, called also Monocalcic phosphate, } contains about 72 % phosphoric acid.

The soluble phosphates are usually stated as equivalent to so much tricalcic phosphate.

Soluble phosphate, multiplied by $1\frac{1}{3}$ } gives the equivalent of tricalcic phosphate nearly.
Biphosphate, „ „ $1\frac{1}{2}$ }

Phosphate of magnesia occurs in small quantity in bones, &c., and is usually reckoned as tricalcic phosphate.

Phosphates of iron and alumina when occurring in *small quantity* are usually reckoned as tricalcic phosphate.

N.B.—Phosphates of iron and alumina *may* occur in such a form as to be *worthless* as a manure.

It would save ambiguity if all phosphates were described as containing so much anhydrous phosphoric acid (P_2O_5) in a soluble or in an insoluble form.

This amount multiplied by 2·18 would then give the equivalent of tricalcic phosphate.

(2.) NITROGEN occurs in manures mostly in three forms. Ammonia salts, nitrates, and albumenoid matter.

Ammonia sulphate (pure), contains $25\frac{3}{4}$ % ammonia.
Ammonia chloride (pure), „ $31\frac{3}{4}$ „ „

Nitrate of soda (pure), contains 16·47 % nitrogen, equal to 20 % ammonia.

Albumenoid matter contains about 16 % nitrogen, equal to about 19 % ammonia, which sooner or later becomes available as plant food.

(3.) POTASH is found in small amount in most manures, and should be reckoned as anhydrous potash (K_2O).

Sulphate of potash contains potassium = 50 % anhydrous potash.
Muriate of potash contains potassium = fully 63 % anhydrous potash.

II. FEEDING STUFFS.

These are chiefly concentrated forms of food whose value depends on the amounts they contain of albumenoids, oil, and carbohydrates.

Albumenoids are compounds containing nitrogen, and more or less resemble dry flesh in their composition. They are sometimes called *flesh formers*. They are the most valuable constituents of feeding stuffs. The percentage of nitrogen contained in a cake multiplied by $6\frac{1}{4}$ gives the percentage of albumenoids.

Good linseed, cotton, and rape cakes should contain from 4 to 5 % nitrogen, about 10 % oil, and about 6 % ash.

Carbohydrates are compounds such as sugar, starch, gum, and woody fibre. (The *digestibility* of woody fibre varies very much, but chemical analysis cannot determine this with any certainty.)

All samples to be sent to Dr ANDREW P. AITKEN, *Chemical Laboratory, Clyde Street, Edinburyh.*

THE CEREAL AND OTHER CROPS OF SCOTLAND FOR 1879, AND METEOROLOGY OF THE YEAR RELATIVE THERETO.

THE CROPS.

THE following comparison of the cereal and other crops of 1879 with the two previous years has been prepared by the Secretary of the Society from answers to queries sent to eminent agriculturists in different parts of the country. The meteorology of the year has been furnished by Mr Alexander Buchan, secretary of the Meteorological Society of Scotland.

The queries issued by the Secretary were in the following terms:—

1. What was the quantity, per imperial acre, and quality of grain and straw, as compared with the average of past two years, of the following crops—(1) Wheat, (2) Barley, (3) Oats?
2. Did the harvest begin at the usual time, or did it begin before or after the usual time? and if so, how long?
3. What was the quantity, per imperial acre, and quality of the hay crop, as compared with average of past two years, both as regards rye grass and clover respectively?
4. Was the meadow hay crop more or less productive than average of past two years?
5. What was the weight of the turnip crop, per imperial acre, and the quality, as compared with average of past two years? How did the crop braird? Was more than one sowing required? and why?
6. Were the pastures during the season of average growth and quality with past two years?
7. What was the yield of the potato crop, per imperial acre, as compared with average of past two years? Was there any disease? and if so, to what extent, and when did it commence?
8. Were there any insects or any weeds injurious to the crops in greater or less abundance than usual, and if so, what were they?

From the answers received the following statistics have been compiled:—

EDINBURGHSHIRE.—Wheat about 25 per cent. deficient in quantity; quality very inferior, being about 60 lbs., as compared with 64 lbs., per bushel; straw good and about average. Barley about 30 per cent. deficient; quality 53 to 54 lbs. per bushel, as compared with 56 lbs; straw good and about average. Oats—quantity about 15 per cent. deficient; quality 42 lbs., as compared with 44 lbs., per bushel; straw excellent and an average. Harvest began about a month after the usual time, but was a very good harvest, and finished within a reasonable time. Hay crop less productive, and also inferior in quality; meadow hay was also less productive, and

inferior in feeding qualities. Turnip crop brairded well,—none re-sown; weight fully 30 per cent. below average; quality fair. Pastures about average growth, but behind in feeding properties. Potatoes less than half the crop,—early varieties the worst; Victorias much better than Regents,—Champions by far the best crop. The whole not bad with disease, and kept well in pits. The cause of the great deficiency of the crops was undoubtedly the wet and sunless summer, especially the great want of sun. In this district the spring was not so bad,—the seed was well put in, and the land was really never very wet until the 13th of July, when such tremendous torrents of rain fell as to drown everything; and after that, the extreme wet and want of sun continued up till 12th September, when harvest began, after which good harvest weather, and grain and straw secured in excellent condition. Potatoes also were stored in good order, and have kept well in the pits.

Linlithgowshire.—Wheat half a crop, and very deficient in quality as regards grain, but straw a fair bulk. Barley one-third deficient, and the quality of the grain very inferior; straw of average bulk. Oats—grain good in quality; yield rather deficient; straw abundant. Harvest a month later. Hay crop average in quantity, but deficient in quality. Hay-making season unfavourable. On clay soils turnips were almost a total failure, and even on dry lands only one-third of a crop. A considerable breadth was sown once and twice over again. Grass abundant, but deficient in feeding quality. Average yield of potato crop about half the average. Disease general, but not to a great extent; crop very irregular, according to soil. Owing to the wet season weeds plenty. Chickweed prevailed to a great extent among all the green crops; wild mustard not so prevalent as usual. Turnip fly very destructive; no other insect in unusual numbers. The season was very cold and wet all through, with a continued want of sunshine, and wheat especially suffered from that cause. Barley has turned out very deficient in malting quality; oats, on the other hand, are heavier in weight than an average, and the grain of good milling quality. Potatoes and turnips on clay soils were failures; on dry soils they were better, but still a very deficient crop. The harvest, from the crop ripening so slowly, was very protracted, but where the crop was not hurried into the stackyard it was secured in good order.

Haddingtonshire.—Barley, 24 bushels, of poor quality. Oats, 44 bushels, of good quality. Straw very fine, having been cut in a greenish state. Harvest a month later than usual. Meadow hay above average. The turnip crop about a third of an average; about one-half was twice sown. The seed brairded well, but the young plants were killed by frost and fly. Pastures an average growth, but not good feeding quality. Potatoes about a fourth of a crop; no disease.

Berwickshire.—Wheat, average before 1878, 30 bushels; in 1878, 28 bushels; and in 1879, 25 bushels. Straw a good crop, but deficient in quality; grain poor and of bad quality. The want of sun injured the wheat crop very much. Barley—average before 1878, 42 bushels; in 1878, 33 bushels; and in 1879, 21 bushels. Straw a fair crop, but not up to the average in quality, owing to the wetness of the season and want of sun; grain of a bad quality owing to same causes. Oats—average before 1878, 42 bushels; in 1878 and 1879, 36 bushels. Straw an excellent crop, and of good quality; grain of good average quality. The wet season seemed to have suited the oat crop well. Harvest was about a month later than usual, beginning about third week in September. Cutting began, in 1878, about the third week of August; cutting generally begins about the second week of August. After harvest did begin, in 1879, the weather kept fine, and the crops were got in in good order as regards dryness. Hay crop, average before 1878, 1¼ tons; in 1878, 1½ tons; and in 1879 1 ton. The crop in

1878 was good and well got in. In 1879 it was poor and much damaged with the wet weather. The rye grass and clover are usually grown together, and were equally affected by season 1879. Average of turnip crop before 1878, 16 tons; in 1878, 17 tons; and in 1879, 7 tons. Crop brairded well in 1879, but did not advance in growth, owing to the coldness of the weather and the heavy rains in summer. Only one sowing. The pastures produced an average quantity of grass in 1879, but it did not feed stock well owing to its deficient quality. The average yield of the potato crop was, before 1878, 5 tons; in 1878, 5 tons; and in 1879, 3 tons. With regard to disease in 1879, Regents suffered very much, but Champions were not affected at all. Disease was first noticed amongst Regents about the end of July. No increase of insects.

Roxburghshire.—Wheat only half a crop; both grain and straw of inferior quality. Barley about two-thirds of an average; grain about 3 lbs. per bushel lighter; quality of straw as good as usual. Oats about one-third deficient in quantity; grain and straw as good as usual. Harvest about a fortnight later. Average quantity of hay crop, but quality not so good. Turnip crop one-third in quantity; quality good. Seed brairded well enough, but did not progress as it should have done from excess of moisture. Pasture of good enough quantity, but did not nourish stock so well as usual. Potato crop one-third deficient in quantity; little disease. Chickweed very prevalent. The deficiency in all the crops was caused by the extraordinary quantity of rain and little sunshine.

Selkirkshire.—Oats—The average quantity ranges from $3\frac{1}{2}$ to 5 quarters; the crop of 1879 was one-third deficient; quality almost an average, and the yield of straw fully an average, and, seeing it was well secured, of fine quality. The harvest began about the third week of September, fully a month after the usual time, and as October was almost wholly dry, the great bulk of the crop was secured in fine condition. The quantity of rye grass hay would be from 150 to 250 stones (22 lbs. per stone), of average quality in dry soils, but in many cases deficient in clover, and, owing to the very unsettled character of the weather, much of the crop was injured in making. The meadow hay crop was a full average, but, like the rye grass, was not in general well secured. The turnip crop was very deficient, and did not reach half an average,—in fact, in heavy soils was not over a fourth of an average, the bulbs being small and inferior. The crop brairded well generally, and, where re-sowing was necessary, the second braird was of slow and unequal growth, and the crop even more deficient. Pastures were of average growth only on dry soils, but owing to the heavy rainfall were much deficient in feeding qualities. The yield of the potato crop was exceptionally small—not nearly an average. Disease existed to some extent among the ordinary varieties, but the Champions were free from disease—of fine quality, though smaller in size, and below an average crop. As to weeds, the ordinary quicken was in so great abundance that it almost wholly choked the turnip and potato crops, and owing to the wet could not be killed. The season was thus by far the worst to the farmer that has been experienced for many years, owing to the great absence of sunshine and excessive rainfall; and while, doubtless, these influences are much against the arable farmer, on this occasion the pastoral or stock farmer suffered to a still greater degree. This was caused by the winter of 1878–79, which, owing to both frost and snow, was almost fatal to many hill stocks; and as this was followed by a very bleak and cold spring, a large percentage (sometimes from 30 to 40 per cent.), of the ewes were enable from weakness to nurse their lambs, and those who did struggle through were so stunted in their growth that they never reached anything like an average size. The prices of sheep stock and wool were also remarkably low, and this, added to the deficiency in numbers, made the revenue

of 1879 to the stock farmer the lowest he has experienced for many years.

PEEBLESSHIRE.—Barley crop—1877, 34 bushels; 1878, 40 bushels; 1879, 24 bushels, or in a good many cases 20 bushels. In 1877 and 1879 there would be about 40 to 45 imperial stones of straw to each quarter of grain; in 1878 about 30 imperial stones of straw per quarter of grain. Oats—1877, 38 bushels; 1878, 47 bushels; 1879, 32 bushels. Straw during last three years very similar to the barley. The harvest of 1879 commenced 20th September, and was the latest on record since 1862. There was not much difference in the hay crop. It is, however, in favour of the two previous years in quantity, and considerably so in quality,—especially so as regards 1878. Meadow hay crops for 1877–79 very similar as regards quantity and quality, but inferior to that of 1878 in both these respects. Turnips were about half a crop,—the average is from 15 to 24 tons; brairded very irregularly, and requiring in many cases to be twice and three times sown, owing to the plants being eaten by fly; on wet lands a complete failure. Pastures were neither as regards quantity nor quality equal to average. Potatoes were scarcely an average crop, but were almost free from disease. The turnip fly or beetle was very injurious. Great difficulty was experienced in keeping land clear, owing to continued wet weather.

DUMFRIESSHIRE.—Oats averaged 36 bushels. Straw about one-third above average, and both grain and straw a full average quality. Harvest from four to five weeks later. The crop of rye grass hay about one-third less, and the quality was not nearly an average. Meadow hay was less productive than average by one-fourth. Turnips averaged 6 tons; quality inferior; the crop brairded very well. Pastures during the season would be of average growth, but deficient in quality, owing to the wetness of the season. The yield of the potato crop would be nearly a half less; very little disease. Owing to the wet season weeds became very abundant in green crops, and after a certain period could not be cleaned.

STEWARTRY OF KIRKCUDBRIGHT.—Little wheat grown. Barley considerably under average, both in quantity and quality. In a few exceptional cases the crop was good. Oats above average in quantity, below in quality, the grain thrashing out light; a great deal much sprouted owing to unfavourable harvest weather. Bulk of straw above average. Harvest from three to four weeks later than usual in the higher and generally later district. The harvest did not commence before 1st October; the crop was well got. Hay crop above average in quantity, but very inferior in quality. Clover generally very strong, and, owing to heavy rainfall, was laid in many cases, spoiling the rye grass. Meadow hay full average; quality inferior. About half a crop of turnips; quality good; brairded well; no second sowing. On some well-farmed lighter lands a fair crop was got; on heavy clay lands in many instances almost a total failure. More than average growth of pastures, but very inferior in quality. Potatoes much under average; quality generally good. The early potatoes (Regents, &c.), one-half diseased; later kinds (Champions, Skerry Blues, &c.), very little disease,—in many cases none. Disease commenced much earlier than usual. No insects. Weeds (red shank, couch grass, and sping, and on the lighter lands, wild mustard), very troublesome in consequence of inability of getting the land cleaned owing to the excessive wet.

WIGTOWNSHIRE.—Wheat, 18 bushels; weight per bushel, 54 lbs.; about 16 bushels less than average; straw of very bad quality. Barley, 25 bushels; 20 bushels less than average; straw inferior. Oats, 30 bushels; weight about 38 lbs. per bushel; about equal as regards quantity and quality. Harvest about five weeks later. Hay crop about 120 stones (of 14 lbs.),

and about 50 stones below the average. Meadow hay crop less, and in many cases destroyed by floods. Turnip crop about 12 tons; 10 tons less than average; brairded well; quality better. Where more than one sowing was required, which was very rare, the cause was fly or wire worm. Potato crop about 200 bushels per acre; about 30 bushels below average. Disease commenced about 1st September. Chickweed and red shank in great abundance.

Ayrshire.—Produce of wheat very irregular; winter wheat on early land may be three-fourths of ordinary crop, but spring sowings have given generally a very poor return; average yield perhaps not far from 18 bushels; quality very inferior; about one-fourth fit only for cattle food. Straw more than average bulk. Barley fair bulk of straw, but poor yield of grain; average about 26 bushels; quality light. Oats about an average in lower parts of the county; deficient in uplands. Yield on high land much better than 1877, but inferior to fine upland crop of 1878. Bulk of straw generally over average; corn and straw together up to average in value. Oats form seven-eighths of entire grain crop. Harvest fully three weeks later than usual. Hay rather above average, but quality inferior to 1878 owing to bad weather. Meadow hay as good as 1877, but much inferior to 1878. Turnips inferior to 1877, and very greatly inferior to 1878,—the worst since draining has become general. Not much complaint as to brairding. Pastures inferior,—too much rain. Early potatoes two-thirds to three-fourths of ordinary crops; late crop very poor on the heavier class of land, and much diseased.

Bute.—Barley about 4 quarters; deficient on poor land; general deficiency in weight 4 lbs. per bushel. Oats about 3 quarters; deficient in weight about 4 lbs. per bushel; very bad crop on cold land. Harvest fully a month later than usual. Hay crop about 1 to 2 tons; inferior in quality. Turnips in many districts a complete failure; 5 to 10 tons considered a good crop; average 20 tons. Crop brairded well, but young plants were killed by cold and rain; a few second sowings rendered necessary by green fly. Potatoes 3 to 4 tons,—about half the usual crop. No more disease than usual. Weeds about twice as abundant on account of the cold and wet.

Arran.—Little wheat grown. Very little barley grown; quality inferior. Oats—quantity about 26 bushels; quality from 2 to 3 lbs. per bushel; under average. Straw—quantity above average, but quality not so good. Harvest from three to four weeks later. Hay about 1½ tons per acre; quantity rather above average, but quality under average. Rye grass seed and clover under average both as to quantity and quality. Meadow hay, quantity fully an average; quality not so good as average. Turnips about 6½ tons; quantity below average, and quality inferior. Braird very bad, and in some places had to be re-sown, owing principally to the wet weather; the crop failed almost entirely in some places. Pastures an average as to growth; quality under average. Potatoes much under average in quantity; in some localities a total failure; quality inferior; quantity saved vary from 1 to 5 tons per acre; in some places about three-fourths, in others about one-third diseased. Disease appeared about the beginning of August. Insects not more than usual. Weeds abundant (owing principally to wet season), in green crop; weeds in white crop being no worse than usual, principally annual weeds—chickweed, crowsfoot, &c.

Lanarkshire.—Some of the wheat never ripened, and is deficient in weight. Oats are a good sample to look at, but are not thrashing well; average weight 39 lbs. per bushel. Straw is only fit for bedding. Harvest fully six weeks late. Hay crop is about 200 stones per acre; the crop not so good in quality as the average.—scarcity of clover. An excellent crop

of turnip on some farms; twice sowing was resorted to in some cases with little result. Pasture deficient, and cattle never thrived on it all season. Potatoes were a fair crop; not much disease. As regards insects and weeds, season 1878 was much worse.

RENFREWSHIRE (Middle and Upper Wards).—Wheat averaged about 22 bushels, of very inferior quality; 12 bushels less than average. Straw would be average quantity, about 34 cwt.; quality under average. Barley averaged 30 bushels, or 10 bushels under average. Straw about average, 26 cwt.; quality under average. Oats about 34 bushels, or 6 bushels less than average. Straw about 26 cwt.; quantity and quality average. Harvest about a month late. About 30 cwt. of hay per acre (rye grass and clover mixed); average, but about 15 per cent. less weight; quality inferior. Meadow hay was average quantity, but inferior quality. Average weight of turnips 6 or 7 tons per acre,—about half a crop. There was very little second sowing. Pastures were average growth, but very inferior in quality. Potatoes about 3 tons, or about half a crop; rather more disease than usual, especially among the earlier varieties. Disease commenced about third week of August. Owing to the very heavy rainfall and want of sunshine, last summer proved one of the most discouraging seasons for agriculturists; and, had it not been for the few weeks of good weather in autumn, during which time harvest operations were speedily carried forward, it would have been still more disastrous. A very few early lots of wheat never ripened, consequently there were few good samples. Owing to the gloomy summer and very late harvest, the great bulk of the crop had to be cut comparatively green, and this accounts for the low yield of wheat, and bad quality of both grain and straw. Very little barley is grown. Oats, not requiring so much sunshine, ripened better than wheat, but when thrashed they also proved deficient both in yield and quality. They were, however, the most successful crop of the season. The hay crop had a good appearance before harvest, but, being soft grown, it shrunk more than usual after being cut, and besides, it got considerably damaged by rain in the making. The consequence was that it turned out inferior quality, and weighed light to its bulk. Meadow hay was even worse; a great part of it was unfit for fodder, as many of the meadows were repeatedly flooded, both before and after cutting. Owing to the cold spring, pastures were about three weeks late, and, although afterwards they looked as well as usual, they had not the feeding qualities. Only a few fields of potatoes approached an average crop, and these were the light dry soils; on the heavy clay soils they were almost a complete failure. The same remarks apply to the turnip crop, but it was even more a decided failure. As a rule the best and driest portions of the brake are selected for potatoes, and hence turnips, being grown on the heavier lands, fared even worse, as many of them were completely soured by the water standing almost constantly in the drills.

RENFREWSHIRE (Lower Ward).—The barley sown was of good quality, both as regards grain and straw, and quite up to the average. The yield of oats may be calculated at not much less than an average, but the quality was much inferior. The seasons of 1877 and 1879 were much alike, and while 1878 was more favourable in respect of the harvest, the dry weather in the spring prevented the crop from producing the yield it would have done. The yield of 1879 was fully 15 per cent. below average, and quality inferior. Straw was not much, if anything, deficient in bulk, but the quality was inferior. Harvest from three to four weeks after the usual time. The quantity of rye grass hay may be stated at about 20 per cent. less than the average, and the quality inferior. Meadow hay less productive and bad quality. The weight of turnips may be stated at about half the average; quality fair, but bulbs very small. Braird good, and second sowing the exception. Pastures deficient, and growth below average, and unusually

late in starting. Yield of potatoes very much below average, 3 to 4 tons an acre being the average crop; quality fair; about one-third of crop of early potatoes being diseased, but late potatoes were less affected, and in some cases little disease appeared at all. Disease commenced as early as 15th August in early potatoes, but in later ones not until September. No weeds, except those indigenous to the soil, were observable—these were abundant; and wire worm appeared in the higher parts of the district, but not generally. The crop of 1879 met with a more disastrous result than the harvest of 1877, the yield from all crops of 1879 proving to be the less productive of the two. Crop 1878 was very good in quality, but deficient in quantity, and superior in every respect to 1877 and 1879.

Argyllshire.—No wheat, and scarcely any barley, grown. Only about one-third of the oats have been thrashed, and that the worst part; the crop is inferior to last year, but it is difficult to say how much at present, probably 4 bushels an acre. Corn is quite 2 lbs. per bushel lighter than last year. The harvest began a fortnight after the usual time. The hay crop was about 1½ tons per acre, which is rather above the average, and nearly one-third of a ton more than the average. This is not a district for clover; a great deal of the arable land is reclaimed moss, on which clover does not thrive. The meadow hay crop was much less productive, and was very late; a good deal of it was not worth much when it was got in. Turnip crop a failure, except on ground naturally very dry; in these spots the crop was a fair average as to quality and size; it brairded well generally. Pastures about an average. A fairish yield of potatoes in dry and readily drained land, but a failure in damp land. Rather less disease than usual, and what there was began about middle of August.

Stirlingshire.—Very little barley grown; oats a full average weight of straw, but, owing to the long continued wet and want of sun, the grain did not ripen out, and consequently is deficient in quality; harvest about four weeks later. The hay crop was a full average as to quantity, but owing to the unpropitious weather much of it was injured in getting, and is, of course, of inferior quality. Meadow hay was fully above the average, but the same remark applies to the getting of it as to rye grass. The turnip crop very inferior, from 10 to 12 tons, less than half the average. The braird was generally good, and only one sowing was required. Pastures were of average growth, but lacked the nourishing quality of the last two years, and stock did not fatten upon them. The average yield of potatoes would be about 4 tons, little over half the usual yield; there was some disease, but not so much as in the two last years. Weeds were very abundant among green crops, the continued wet and want of sun rendering horse or hand hoeing of no avail.

Clackmannanshire.—Wheat, five-eighths of a crop; quality inferior. Barley not more than half a crop; scarcely any of the crop fit for brewer's malt. Oats not more than three-fourths of a crop; quality under average. Harvest began about three weeks after usual time. Hay crop about an average, but most of it was not well got in consequence of the wet season. Meadow hay was a fair crop. Turnips not much more than third of usual crop. A fair quantity of grass, but in consequence of so much wet very little feeding in it. Potato crop considerably less than usual; quantity not good; a considerable number of weeds among green crop.

Perthshire (South-west Division and Carse of Stirling).—Average produce of wheat in 1879, 18½ bushels; 1878, 29 bushels; and 1877, 22½ bushels. Average weight in 1879, 55 lbs. per bushel, and quality inferior. Straw rank and bulky in 1877 and 1879, short in 1878. Barley—average produce in 1879, 21 bushels; in 1878, 31 bushels; and in 1877, 27 bushels. Average weight in 1879, 52 lbs. per bushel, and quality bad for malting purposes. Straw deficient in quantity and quality. Oats—average produce

in 1879, 36 bushels; in 1878, 31 bushels; and in 1877, 33 bushels. This applies chiefly to the yield of the fertile fields on the banks of the Forth. The upper dry field farms may be safely stated at a fifth less. Average weight of marketable grain, in 1879, barley 40 lbs. per bushel; quality middling, proportion of small grain more than double the usual quantity. Straw abundant in 1877 and 1879, but generally inferior fodder to 1878. Harvest commenced a month after usual time, one of the latest on record. Average produce of hay crop in 1879, 144 stones; in 1878, 160 stones; and in 1877, 136 stones. Quantity nearly average, but quality in 1877 and 1879 inferior, being much damaged by weather and want of sunshine when maturing. Meadow hay much less in bulk, greatly deteriorated by weather in swathe and cole, especially where the acreage was large; small patches made quickly after mower better quality. Turnip crop about 8 or 10 tons per acre, or half the quantity, and not good feeding quality. Only one sowing required generally. Pastures very inferior and deficient in quantity, bad alike for feeding and dairy purposes. Potatoes were a very variable crop, in some cases much diseased, and a complete failure in 1877 and 1879, but generally a good crop in 1878; average yield about 6 tons in the dry and 3 tons in the two wet seasons, including small and diseased roots. Disease commenced about usual time. No fly worth mentioning, nor were weeds more abundant than usual, only the grain crop and fallow breaks were ill to keep clean.

Perth and Part of Forfar.—Wheat from 2 to 3 quarters, one-half below average, and of very poor quality; straw thin on the ground, and of bad quality. Barley from 2 to 5 quarters; about one-fourth less grain, and in some instances one-half light in quality and deficient for malting purposes. Oats from 5 to 7 quarters, average both as to grain and straw. The harvest commenced 18th September, fully a month behind the usual time. Hay crop 2 tons, quality inferior, and one-third less in quantity both as regards rye grass and clover. The turnip crop, especially the Swedish, were re-sown in a great many instances, and where they did grow, the yield was half the average, from 8 to 12 tons; the yellows were a better crop, nearly an average, and would weigh from 16 to 20 tons. The pastures were not nearly equal to 1878, but might be compared to 1877. Average weight of the potato crop from 3 to 7 tons. The crop was equal to 1877, and less diseased. Champions were equal to 1878, but Regents and Victorias inferior. The turnip fly was generally more injurious during the spring than former years, and from the continual wet weather weeds were very abundant, and almost impossible to be kept down among the turnips and potatoes.

Forfarshire.—Wheat about 1½ quarters; grain very inferior, average weight 55 lbs. per bushel; straw average quality. Barley about 3 quarters; grain inferior, average weight about 50 lbs. per bushel. Straw average quality. Oats a fair crop, but cut when green; grain therefore below standard in weight, about 5 quarters; weight 38 to 40 lbs. per bushel; straw excellent quality. Harvest about four weeks later than usual. Hay about 2 tons, quality inferior. The weight of the turnip crop about 10 tons, quality fair; brairded very well, but was destroyed by fly; more than half had to be re-sown. Quantity of potatoes about 5 tons, as against 7; very little disease. Turnips were the only crop affected by insects, and they were very much injured thereby.

Aberdeenshire.—Little wheat grown. Barley is the most deficient of the cereal crops; the average quantity would not be much over 2½ quarters, and the average weight about 48 lbs. The general average of barley would be about 5 quarters, and the weight 53 lbs. Oats was generally a bulky crop, but with the early frosts it was badly filled; the yield per acre would be about 3 quarters, and the weight from 36 to 40 lbs.; the straw

is exceedingly good quality, having been cut before the sap was out. The general average of oats would be about 4½ quarters, and weight 40 lbs. The harvest began about the second week of October, which was about five weeks later than in average years, and then the crops were not nearly matured. The hay crop was generally lighter than usual; the average quantity per acre would be about 160 stones; the quality fair, being thin of clover. Rye grass seed poor, both in quantity and quality, weighing from 16 to 20 lbs. per bushel. No meadow hay grown. The turnip crop has been almost a failure, although on a few fields of gravelly land there is a fair crop; the weight would not exceed 6 tons, and in average years the weight would be from 20 to 25 tons. In some parts a second sowing was required, owing to the ravages of the fly. The pastures were very poor all through the season, and in some parts the hay crop was cut green and carted into the fields to keep the cattle alive. It was the worst grass season for many years. The potato crop was generally very deficient in quantity, but the tubers were of better quality than in general years. The quantity would be from 2 to 3 tons; in general years the quantity would be from 5 to 7 tons. Weeds were generally very abundant, and owing to the unprecedentedly wet season were difficult to eradicate.

Aberdeenshire (Parish of Forgue).—Barley very deficient in quantity and quality. The deficiency estimated at 2 quarters per acre, and the deficiency in weight fully 6 lbs. per bushel; former average 56 lbs., this year under 50 lbs.; straw of average quantity and quality. Oats—grain deficient in quantity by 1½ quarters, and in weight 2 lbs. per bushel on the best and earliest farms; whilst on late high lying or clayey land the deficiency in quantity was about 2 quarters, and the quality of grain very bad, in some cases unfit for seed, and not yielding 1 boll of 140 lbs. of meal to the quarter of oats; large bulk of straw, but not well-ripened; harvest a month later than usual. The quality of the hay crop was good when not cut very early, and a fair mixture of rye grass and clover; when cut very early the crop much damaged by rain; quantity about 5 cwt. deficient per acre. Turnip crop very deficient in good land, and on stiff clayey soils almost a perfect failure; the deficiency on best soils one-half, and on poor soils three-fourth; late sown Swedes had to be re-sown, but early sowing and yellow turnips made a fairly close braird. Pastures of sown grasses very deficient all the season in consequence of the cold wet weather; kept at least one-third fewer cattle and sheep than usual. Potato crop good quality, but small size; yield one-third less. No unusual destruction of crops by either insects or weeds.

Aberdeen and Banffshires.—Barley a very deficient crop, yielding from 1⅛ quarter to 3 quarters, the average not exceeding 2⅜ quarters; quality of grain dark coloured and very light; straw in many instances good, but very green; the average returns were much over this, at least 1⅛ quarters; weight, particularly of crop 1878, 4 to 5 lbs. per bushel over that of crop 1879. Oats a fair yielding crop, although in many instances not equal to former years, this arising from the lateness of the harvest, crop not being fully ripened; the produce being from 3 to 4 quarters, and on some superior lands as high as 4½ to 5 quarters were thrashed out; the weights very various, from 30 lbs. to 43 lbs per bushel; the oat harvest did not commence till the first week of October, barley harvest fully a week earlier; harvest of 1878 more than a month earlier than 1879, whilst that of 1877 was not more than fourteen days earlier than that of 1879. Hay crop (rye grass and clover) would average from 1 ton to 1½ tons, being under the average of bygone years; quality very fair, but not quite equal to former years. Turnips, on dry loamy fields in good order, yielded 10 to 14 tons; where the land was soft, low lying, and badly drained, not more than 4 to 6 tons; the crop brairded badly; owing to excessive rains, a second, and, in some

instances, a third, sowing was necessary; average much in excess of 1879; the pastures were also deficient, and did not stand the amount of eating compared with that of former years, and consequently cattle did not thrive so well. Not many potatoes grown, and those planted did not nearly come up to average; the average yield, in many instances, being 4 tons, whereas the two previous years might have been nearly a half more; crop only slightly diseased, and symptoms of such disease generally shown about middle of August. The disastrous season of 1879 was owing to the excessive rainfall during the season. As the quantity of barley *now* sown is at least six times in excess of what was sown twenty years ago, and as this crop was deficient in yield by at least one-half of bygone years, and prices of cattle very low and oats low priced, these, combined with dull trade all over, and the fact of the turnip crop, on which so much depended, having proved a comparative failure, the season of 1879 must be pronounced as the most disastrous to farmers as any they have passed through during the last twenty years. The above remarks are applicable to Forgue, in the north-west district of Aberdeenshire, and Inverkeithny in the south-east district of Banffshire.

Aberdeen and Banffshires.—Barley, 2½ quarters in 1879 against 4 quarters in 1878. Oats, 3½ quarters in 1879 against 4½ in 1878. Harvest four weeks later. Hay crop, 120 stones of 22 lbs. in 1879 against 150 in 1877 and 1878. In 1879 the quality of the hay was inferior. Turnips, 7 tons in 1879 against 15½ in 1877 and 1878; braird of 1879 partly destroyed by frosts and partly by fly; half the crop in 1879 had to be sown twice. Pastures were abundant in quantity, but greatly awanting in feeding power. Potatoes not grown as a crop, but merely for family use.

Banffshire.—Barley, on good dry land, approached two-thirds of an average crop; on damp or cold land the out-turn of grain was under half an average; straw was an average bulk, but soft; the grain was inferior, and from 3 to 4 lbs. per bushel under an average weight. Oats, in the lower district, was a fair average both in quantity of straw and quality of grain; in the middle of the county, on moderately dry land not exceeding 700 feet above sea-level, the crop was about three-fourths of an average in quantity, the quality varying from 1 to 3 lbs. per bushel under an average weight; in the higher districts of the county, with the exception of some of the earlier farms, the crop was more or less a failure; the grain was under a half in quantity, weighing only from 34 to 38 lbs. per bushel; the harvest was nearly a month later than usual. On dry land there was a fair bulk of well-mixed clover and rye; on cold clay land the grass suffered greatly by the severe winter of 1878–79, and did not produce half an average bulk of inferior quality. Turnips did not exceed half an average crop on dry land, on cold clay or wet land the crop will not amount to one-fourth of an average; they brairded fairly well, but lacked vigour throughout the whole season. On dry land, with an open subsoil, the pasture was a full bite during the summer, but on cold wet land it continued stunted and worthless; on the best land the grass lacked quality, and stock made little progress in consequence of continual scouring, owing to the quantity of water in the grass or imbibed along with it. Potatoes are not grown extensively as a marketable commodity; as a crop, they were much under an average both in quantity and quality. Insects were less injurious than usual; the grain crops suffered very little from grub worm, and the fly did no damage to the turnip braird.

Morayshire.—Wheat two-fifths under average as to quantity; quality of grain under average 2 lbs. per bushel; quantity and quality of straw fully average. Barley about one-half under average of grain, quality under average 2 lbs. per bushel; quantity and quality of straw average. Oats fully average as to quantity and quality of grain; quantity of straw considerably over average; quality average. Harvest from three to four weeks behind

usual time. The quantity of the hay crop would be under average, more especially on account of the extremely wet character of the weather, which prevented the crop from being properly harvested, lessening the quantity, and deteriorating the quality. About one-half of the turnip crop would be one-third under the average, the other part about one-half below the average ; quality average ; in general the crop came up well, in a few cases a second sowing was necessary. Pastures were considerably under average as to growth and also as to quality ; stock did not make much progress upon them. The yield of the potato crop would not be over one-half as to quantity, except in cases where Champions were planted, which turned out a fair crop, on account of no disease affecting the stems. Towards the end of July and the beginning of August the stems in most cases were attacked by disease, which stopped the increase of the tubers, but did not much affect them. No insects in particular, but weeds of all kinds made progress, more especially amongst turnips, the wet weather preventing their destruction by hoeing. An extreme quantity of rain fell during the summer, and the temperature was very low up to the latter half of the month of August, when a change took place for the better. The crops of grain, on good well farmed land, were very heavy and much laid, so much so that they could not be cut with machinery. The weather during harvest was most favourable, scarcely a drop of rain during the whole time. No one ever remembered seeing a whole crop harvested in such fine condition ; on that account, the quality of both grain and straw was much improved.

Nairnshire.—Little if any wheat grown. Barley 2½ quarters, grain being under an average ; straw abundant and good ; weight a good average ; oats 3½ quarters per acre ; crop well strawed. In the lower district crop is thrashing out better than the barley, but in the higher districts there is a considerable deficiency. Harvest three weeks later than usual. About an average hay crop ; clover was unusually abundant, but rye grass thin. Turnips brairded well, very little second sowing required ; quality good, but one-third under average. Pasture grass abundant, but feeding quality poor. Little more than an average crop of potatoes ; very little disease. Neither insects nor weeds more numerous or injurious than usual. Want of sunshine and heat during summer believed to be the principal reason for the deficiency in crops.

Inverness-shire.—No wheat grown. Barley about 3½ quarters ; quality inferior, being light and not well-coloured ; large quantity of straw, and the crop much lodged. Oats a very bulky crop ; much lodged, and not thrashing as it bulks ; quantity about 4 quarters ; quality good ; weight about an average. Harvest a month later than usual. Hay crop not good, and not nearly an average ; scarcity of clover ; and the rye grass badly ripened and light in weight ; quantity about 1 ton. No meadow hay grown. Along the sea shore, and inland about a mile, the turnip crop was fair, though inferior to previous years, yellows being a better crop than Swedes ; weight from 12 to 20 tons ; not much second sowing. Pastures very good, particularly on the light sandy lands. Potatoes small, and a very poor crop ; disease appeared about the middle of August, though there was not much disease at lifting time. The above refers to the lands lying along the shore of the Moray Frith, and for about two miles inland, beyond which the crops were entirely different, being late and not ripened.

Inverness-shire (Skye).—Barley one-third less. Oats equal to average. Harvest about three weeks later than usual. Both rye grass and clover fully equal to average as to quantity and quality. Meadow hay crop about an average. Turnip crop same weight and quality as average ; brairded well, and did not require second sowing. Pastures quite as good, but later. Potato crop fully equal to average ; no disease. The crops were secured in unusually good condition, as the weather had improved before harvest work

began. Owing to the very mild weather in October and November turnips continued to grow till late in the season.

Ross-shire.—Wheat average 2½ quarters; quality of grain and straw inferior; quantity of grain about 80 per cent. of average; quantity of straw large, but inferior in quality from wet and sunless weather. Barley—average 3½ quarters; quality inferior by 2 to 3 lbs. per bushel; straw, sound, average quantity and well-harvested. Oats—average 4½ quarters; quality of grain about 1 lb. per bushel under; straw 10 per cent. over the average; quality better as better harvested. Harvest usual time, from middle of August to middle of September. Harvests of 1878 and 1879 began and ended a month behind usual time. Hay crop 1½ tons; up to average as regards quality, and ½ ton under average as regards quantity; more rye grass than clover this year. Turnip crop—Swedes, 1877, 13 tons, small though fair quality; 1878, 20 tons, first-rate quality; 1879, 12 tons, small; quality indifferent. Yellows—1877, 17 tons, good; 1878, 15 tons, good; 1879, 15 tons, good; only one sowing required though stiff in coming to hoe for want of heat; Yellows a better crop than the Swedes as a general rule. Pastures a month later in starting; above an average growth; afterwards deficient in feeding quality, especially for sheep, owing to continuous dripping and want of heat. Potatoes—1877, about 6 tons per acre, but badly diseased; 1878, about 4 tons, not much diseased; 1879, about 4 tons, a little disease, but variable in its first appearance; on some farms appearing early and others late; Champions free from disease. No insect noticed. Late season prevented ground from being thoroughly well cleaned of quickens, which were abundant all through the season, which was a wet one. This return relates to the basin of the River Conan, from where the river emerges from the hills down to its entry to the Cromarty Firth.

Sutherlandshire.—Barley—grain one-third short in bulk, and from 2 to 3 lbs. per bushel lighter than usual; plenty of straw. Oats variable; grain below an average in weight and bulk, but not nearly so much as barley; straw above average. Harvest from two to three weeks later. Hay crop, quantity very variable, but in every case below an average; on many farms a complete failure. Clover grew much worse than rye grass; crop much spoilt by wet weather after being cut. Turnips will be a third short; on poor badly farmed land they are very bad. Pastures on an average, but wanted feeding quality. Disease appeared early among the potato crop and stopped their growth; they are only half a crop; Champions escaped disease, and are a good crop.

Caithness-shire.—Bere one-third less in quantity, and from 5 to 8 lbs. per bushel deficient in weight. Oats a full average bulk; produce one-third short in quantity, and from 5 to 7 lbs. per bushel in weight. Harvest from two to three weeks later. Hay crop—quantity and quality about an average; meadow hay under an average. The turnip crop brairded well, and early sown turnips in favourable circumstances a good crop; weight may be stated from 5 to 20 tons. The growth of pastures was fair, but the universal observation was that cattle and sheep did little good. Potato crop deficient in quantity by one-fourth; tubers small; not grown to any extent for market. The season in Caithness was cold and wet; about one-third of the turnip crop where sown early, and, on land with an open subsoil, turned out good; the rest might be from 5 to 12 tons per acre. Potatoes are not grown for market, unless a few exported for seed, so that the money returns are not much affected. About the middle of October there was a fortnight of fine weather, which was of great benefit. Harvest in Caithness is usually not general until the second week of September.

Orkney.—No wheat, and little barley, grown. Bere short of quantity and quality. Weight 48 lbs. as compared with 54 lbs. Straw good. Oats

deficient in quantity and quality. Average yield about 23 bushels per acre; weight, 37 lbs. as compared with 44 lbs. per bushel. Straw good and plentiful. Harvest commenced about end of September, a fortnight later than usual. Quantity of hay crop about 200 stones; quality fair. Clover and rye grass fair. Turnip crop about 10 tons; quality much like last season; brairded badly, and requiring to be sown over and over again in some instances. The pastures were of an average growth and quality. Potatoes very deficient, not above 2 tons; disease commenced in August; runch or wild mustard was the most abundant weed. There was a gale of wind on the 23d September 1879 which shook the standing crops so violently, that they received no sustenance afterwards from the soil, which accounts for the light weight and inferior quality of the grain.

Shetland, (Unst).—Bere grown pretty extensively; yielded about three-fourths of an average. Straw perhaps under that; quality good, but grain light. Oats was about an average as regards quantity of grain, but the weight may be stated at 2 to 3 lbs. per bushel light; quality generally injured by wet harvest; straw short, and consequently about one-fifth light. Harvest began about ten days later than an average of the last nine years, excepting 1877, which was ten days later than 1879. Rye grass and clover were an average crop when cut, but they were more or less damaged by rains before being cured. Meadow hay crop was about an average, but damaged in curing. The weight of the turnip crop not much over half; quality very good; brairded well; few cases of second sowing; plants were sadly hurt, immediately before and after getting the rough blade, by cold east winds; this retarded singling, and generally the crop never recovered. The spring was late and cold, which kept the pastures long bare, but after June there was an abundance, although the quality was not considered good. The yield of the potato crop was about one-fourth less in bulk; there were plenty in number, but very small; very little disease heard of; no insects; weeds not so abundant as often seen; turnip crop easily kept clean. The winter of 1878–79 was characterised by heavy rains and severe frosts, which began on 4th December 1878 and continued with little intermission till middle of March 1879, a most unusual thing for Shetland. The spring was cold and dry with parching east winds. The summer was cold and dry till end of July, when hot weather set in, with winds still prevailing from north and east, and continued all through hay and corn harvest. Cattle generally made little progress on the grass, owing no doubt to the excessively low temperature which prevailed all through the season. Contrary to all past experience the heaviest rains were from the north-east and east, and consequently very cold.

Shetland (Fetlar).—Chester bere, which is used instead of barley, was fully an average crop, both as regards quantity and quality. There was a full average crop of straw as well as grain. There was a good crop of oat straw, but the grain was light and deficient. The harvest was fully a fortnight later. It was not, however, very late. Here we began to cut bere about the end of August or beginning of September. It was perhaps about a fortnight after that when we began to cut oats. Rye grass and clover were very much above average. It was about the heaviest crop of rye grass and clover ever seen, but, on account of the rainy weather, it was very difficult to cure; still it was cured without receiving much injury. The meadow hay crop was above an average as regards productiveness, but from the quantity of rain that fell after it was cut it was very difficult to cure. Both the weight and quality of the turnip crop were fully an average; the crop brairded very well, and no second sowing required. The pastures during the season were fully an average. Potato crop fully an average; in some fields there were a few blanks from the seeds not springing, but there was no disease, and the crop was good both as regards quantity and quality.

METEOROLOGY.

The harvest of 1879 will be long remembered as one of those disastrous events in the history of our Scottish agriculture, which the past 116 years show to have occurred about once in a generation. The immediate cause of this national calamity was the unbroken cold weather which prevailed during the growing months of the year, and the inevitable accompaniments of cold summer weather, viz., clouded skies, little sunshine, and frequent and superabundant rain.

From 1764, the year from which we possess a continuous record of temperatures made with thermometers, there have occurred five years when the deficit of summer heat was so continued and so serious as to result in disastrous failures of the crops. These years, with the average monthly deficiency of temperature of the seven growing months from April to October were,—(1), 1782, the "black auchty-twa," when the mean deficiency of temperature amounted to 5°·1; (2), 1799, the year of "the dearth," when the temperature was 3°·3 below the average; (3), 1816, when the temperature was 2°·9 deficient; (4), 1860, when the temperature was 2°·0 deficient; and (5), 1879, when the temperature was 2°·4 below the average.

Much the same story is told if we take the mean deficiency of temperature for the five months from April to August. The figures then show a deficiency of 5°·3 for 1782, 3°·8 for 1799, 3°·2 for 1816, 2°·1 for 1860, and 3°·2 for 1879. The significance of these figures will be better seen if the results of an inquiry made in 1862 by the Scottish Meteorological Society under the direction of the Marquis of Tweeddale, be kept in mind, by which it was proved that a deficiency of 2°·5 from the average temperature of the grain growing districts, merely during the time from the earing to the reaping of the crops, is insufficient for their proper ripening. Now in each of these five disastrous years this lowering of the mean temperature was spread over seven months; and it is to be remarked that, in 1879, from the middle of June to the middle of August, the temperature was about 3°·5 under the average over a large part of Scotland.

In order to present in its broad features the weather of 1879, seven maps have been constructed showing the degree to which the temperature fell below the average of each month from April to October, or rose above it, over all parts of Scotland; and similarly, other seven maps showing the percentage of the rainfall above or below the average of the month. A set of tables have also been prepared giving the daily rainfall for the same months from many places representing the various districts. From these maps and tables the following brief account of the weather of Scotland during the growing months of 1879 has been

prepared,—the maps and tables themselves being lodged with Mr Menzies, Secretary of the Society.

APRIL.—In this month the temperature was everywhere below the average, most so along the Tweed and the Dee, where it was as much as from 4° to 5°, the deficiency being greatest at the elevated stations of Dalnaspidal, Braemar, and the North Esk Reservoir in the Pentlands. On the other hand the deficiency was only half the above amounts, and in a few districts even less, in the north and north-west, being only 1° in Shetland, and from 2° to 3° in Orkney, the Hebrides, and the west coast, from Cape Wrath to Skye. The rainfall was in excess over the whole of the east of Scotland, except the counties of Perth and Stirling, the excess being greatest generally where temperature was lowest, running up in many cases to a half more than the average; whereas in the west the rainfall was in most places only half the average of April, and from Skye northwards to Tongue it amounted to a fourth only of the usual amount. Thus, speaking generally, the weather was excessively cold and wet in the east, but in the west cold and dry, and becoming on advancing to the north-west and north, dry, and not unseasonably cold.

MAY.—The weather of May was equally cold and unseasonable, the deficiency of temperature from the average of May closely resembling in amount and distribution over the country that for April with two noteworthy exceptions,—these exceptions being the whole of the west from Cape Wrath to Islay over which temperature was relatively a degree colder, and the east board of Scotland to south of the Grampians, as far as the Firth of Forth, over which it was a degree milder. In the east to the north of the Grampians, and northward into Orkney, the rainfall of May was usually heavy, being at least double the average at Elgin, Tain, and Dunrobin; but elsewhere it was generally a little below the average, rising, however, over a few limited districts somewhat above it. Hence the lands sloping to the Moray Firth had the disagreeably cold and wet weather which characterised April extended in an aggravated degree into May; whereas elsewhere the weather of May, while still exceptionally cold, was dry.

JUNE.—In this month the temperature from Aberdeen round the Moray Firth to Dunrobin was between 3° and 4° below the average; whereas on the other hand on the opposite sides of the island to the south-west or within the district marked off by a line passing from Crinan round by Roy Bridge, thence across to Dunvegan, and passing out by North Uist, the temperature was about the average of June, rising even at one or two places a few tenths of a degree above it. In other districts of the country, temperature was pretty generally about 2° below the

average, falling at a few places to a deficit of 3°, whilst at other places a deficiency of only a degree and a half was recorded. As regards the rainfall, different districts were contrasted with each other in the strongest possible manner. On the one hand, over the whole west, from Crinan northwards, the rainfall was under the average, amounting at places near the coast to only half the rainfall of the month. On the other hand fully double the average rainfall was recorded at Dundee, St Andrews, Loch Leven, Rothesay, Paisley, Glasgow, the Pentlands, Edinburgh, Leith, Dalkeith, East Linton, Marchmont, Wooplaw, Thirlestane Castle, Jedburgh, Wolfelee, and on the Solway Firth at Dumfries, Cargen, and Silloth. Along the Moray Firth the rainfall was only a half more than the average, diminishing northwards to the average at Wick and westwards to the average along the watershed in Sutherland, Ross, and Inverness-shires. On the coast of Ayr the excess was only a fourth above the average. Hence, then, June was a fine month along the west, from Crinan northwards, being characterised by dry bracing weather of the average temperature; whereas over the whole of Scotland, south of the Grampians, the weather was wet and sunless in a most exceptional degree. Along the Moray Firth the low temperature and large rainfall point to a continuance there, though in a less aggravated form, of the disastrously cold wet weather which characterised the two preceding months. The amount of cloud noted at the Stations was the largest, and the number of hours of sunshine the fewest, hitherto recorded in any previous June by the Scottish Meteorological Society's observers; and these features of the weather, which so powerfully influence the crops at this season, were most strongly pronounced in those districts indicated above, where the rainfall was so excessive.

July.—In Shetland, Orkney, Skye, and the southern division of the Hebrides, the temperature was not quite a degree under the average. Elsewhere the defect of temperature varied from 1°·5 to 3°·5, the greatest deficiency being in Berwickshire, along the Forth and its Firth, the Dee and Don, and the southern shores of the Moray Firth. From the Grampians southwards, to a line drawn from Crieff to St Andrews, the deficiency scarcely amounted to two degrees. Everywhere else, except in two small patches, one in Perthshire, about Crieff and Aberfeldy, and the other in the high grounds in the north of Dumfriess-shire, the rainfall was above the average of July, very largely, and in some cases unprecedentedly so, in the counties of Berwick, the Lothians, Forfar, and the west shore of the Moray Firth. The excess was least along the coasts bordering the Minch where it did not amount to 20 per cent., and it is to be noted that it was along these coasts where the temperature did not fall much below the average. During the great storm of rain of July 13–14, fully

three inches of rain fell within a space of about twenty-four hours at several places in Mid and East Lothian. It is a singular fact in the meteorology of Scotland, that rains approaching these in depth of fall, or even rivalling them, occur with east winds by no means rarely in eastern districts of the country, whereas in the much wetter climates of the west, even where the average annual fall approaches 100 inches, such heavy daily falls as deluged the Lothians on July 13–14, have not yet been recorded. In no previous July, or, indeed, in any previous summer month for which we possess the required observations, has there occurred more cloud and fewer hours of sunshine, the cloud being 22 per cent. above, and the hours of sunshine 35 per cent. below the averages. These conditions of weather, so detrimental to the growing crops, were most disastrously felt in the east to the south of Stonehaven, and least in Shetland, Orkney, and the country on both sides of the Minch.

AUGUST.—Taking Scotland as a whole, the temperature was not quite a degree below the average, approaching the average and in one or two cases slightly exceeding it, south of the Firth of Forth and along the western slopes of the country; whereas over the rest of Scotland, temperature was fully a degree under the average. The distribution of the rainfall closely followed that of the temperature inversely. Thus to south of the Firth of Forth and in the west, the rainfall either little exceeded or fell little below the average, the departures from the average being generally much less than 30 per cent.; whereas in the east from the Pentland Firth to the Firth of Forth the rainfall was pretty uniformly about 50 per cent. in excess. This is the first month during which the weather conditions were not unfavourable in the important agricultural district of the Lothians; whilst to the north of the Lothians, the deplorable weather which characterised the previous months, was still continued. On the other hand, in the west from Argyllshire northwards, there was still a continuance of the not unfavourable weather of June and July. Cloud still remained above, and sunshine below the averages, but the departures were inconsiderable in comparison with what has been detailed regarding June and July.

SEPTEMBER.—In the extreme north of Shetland, temperature was only slightly below the average, but on proceeding southwards, the deficiency increased gradually to about 3° in the extreme south, a deficiency of 3° being slightly exceeded at Milne Graden on the Tweed, Wolfelee in the Cheviots, and Silloth and Cally on the Solway. The distribution of the rainfall was completely reversed from what had prevailed for some months. Now over the whole of the eastern slopes, and in Clydesdale above Glasgow, the rainfall was below the average, and largely so, amounting to 50 per cent. or more, particularly near the coast;

whereas over the whole of the west from Cape Wrath to the Mull of Galloway, including Western Perthshire, heavy rains set in, amounting during the month to an excess of fully 50 per cent. above the average, rising, down the Clyde, to 83 and 106 per cent. of excess. It is unnecessary to remark on the important bearings which the dry weather of the east, and the wet weather of the west, had on the crops during the critical month of September.

October.—Over that division of Scotland situated to the north of the Grampian range, temperature was a little above the average, but on crossing the range, it fell below the average,—the greatest depression of temperature occurring in the south-east, in Tweeddale where it was fully two degrees below the average. In all districts of the country the rainfall was small, the greatest deficiency being in the east, to the south of the Moray Firth; the deficiency in many places being from 70 to 80 per cent.

In the west the cutting of the harvest commenced from ten to twenty days later than the average of seasons, whereas in the east, from Aberdeenshire southwards, the commencement of cutting was about double this time later than usual. This difference was entirely due to the weather in the west up to the time of cutting, having been characterised by a higher temperature, more sunshine, and a rainfall considerably under the average. On the other hand, from the middle of September, fine weather set in in the east, and dry weather ruled till the end of harvest; whilst in the west the weather broke in the last week of August and continued wet and backward, with little intermission till the beginning of October.

The wheat and barley crops were everywhere below the average, the general deficiency being from a third to a half, and as regards both these crops the quality was very inferior.

On the other hand, oats were an average crop as regards quantity in a large number of the districts, even rising in a few of the districts somewhat above the average. The exceptions were Aberdeen, Argyll, Bute, Arran, Clackmannan, and all to the south of the Firth of Forth. In these south-eastern counties, the deficiency varied from a sixth to a third. This cereal was also an average, as respects quality, over a large number of the districts, the chief exception being the strip of country extending from Greenock to Aberdeen. In the south-eastern counties, whilst the crop was under the average in quantity, it was of average quality,—a result probably due to the extraordinarily wet and sunless weather which prevailed from June to September 12th, and the fine harvest weather which succeeded. As regards the tract extending to the north east from Greenock, temperature was lower there during June and July than to the north and

south, and the rainfall during these months and August was peculiarly heavy, and as regards the country lying from Greenock to near Stirling, also in September. These results are mainly to be attributed to the lowering of the watershed in this part of Scotland, the results of which were on the one hand the extension down the Clyde of the wet cloudy weather brought by the east winds, and on the other the extension far to eastward of the wet cloudy weather brought by the south-westerly winds from the Atlantic—results which do not occur farther to south and north owing to the high mountainous ridges which there separate the east from the west.

Excepting in the north-west, the turnip crop was everywhere a miserable failure. The deficiency was nowhere less than a third below the average, being, however, in the great majority of cases a half, and in some three-fourths or four-fifths.

Potatoes were also under the average everywhere except in the north of Shetland, but the failure generally was not so great as in the case of the turnip crop. The failure was greatest in East Lothian, where the crop was only a fourth of the average and in Berwickshire the deficiency was nearly as great. In other words, where the summer rains were the heaviest, the sky most clouded, and sunshine the least, the failure of the potato crop was most complete.

AGRICULTURAL STATISTICS OF SCOTLAND.—Returned upon 4th June 1879.—(*Extracted from the Government Returns.*)

TABLE No. 1.—Total Acreage under each kind of Crop, Bare Fallow, and Grass, in each County of Scotland.

Counties.	Total Acreage under Crops, Bare Fallow, and Grass.	Corn Crops.							Green Crops.							Clover, Sanfoin, and Grasses under Rotation.	Permanent Pasture or Grass not broken up in Rotation (exclusive of Heath or Mountain Land).	Flax.	Bare Fallow or Uncropped Arable Land.
		Wheat.	Barley or Bere.	Oats.	Rye.	Beans.	Peas.	Total.	Potatoes.	Turnips.	Mangold.	Carrots.	Cabbage, Kohl-Rabi, and Rape.	Vetches, &c.	Total.				
	Acres.	Acres.	Acres.	Acres.	Acres	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres	Acres	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
1. Aberdeen	601,964	111	18,889	190,487	711	213	197	210,608	7,769	93,537	82	84	57	2,541	104,070	259,864	26,560	1	891
2. Argyll	118,587	8	2,464	20,302	509	414	14	23,711	6,736	5,483	119	35	139	68	12,580	19,470	61,660	—	1,169
3. Ayr	315,489	3,717	4,100	48,749	288	1,546	17	58,417	8,737	8,168	921	444	75	161	18,506	103,603	132,272	4	2,087
4. Banff	166,820	236	8,495	52,397	170	228	29	61,555	2,499	25,359	5	3	5	822	28,693	66,946	9,338	—	238
5. Berwick	194,278	2,569	24,481	34,013	94	1,938	228	63,323	2,913	30,522	128	22	718	911	35,214	60,498	55,201	—	242
6. Bute	24,986	78	807	4,596	51	115	10	5,657	1,344	1,555	10	2	1	19	2,931	6,573	9,743	—	82
7. Caithness	105,493	12	1,425	34,335	162	2	38	35,974	1,995	14,024	2	1	52	798	16,872	26,192	25,798	—	657
8. Clackmannan	15,652	786	936	3,075	2	796	—	5,595	392	958	22	—	18	86	1,476	3,196	5,129	—	256
9. Dumbarton	46,314	1,404	327	8,002	6	266	—	10,005	3,019	1,645	33	40	78	98	4,913	13,314	17,982	—	100
10. Dumfries	229,256	152	1,347	48,198	79	95	10	50,181	4,881	20,229	87	46	331	136	25,710	63,656	88,780	—	926
11. Edinburgh	134,249	5,055	12,131	20,758	142	315	51	38,452	7,365	11,727	24	26	826	969	20,987	31,868	42,720	—	242
12. Elgin	104,649	2,317	15,450	22,617	1,132	80	12	39,608	3,475	16,353	18	2	6	496	20,260	39,824	5,235	—	222
13. Fife	245,696	13,120	41,904	38,157	977	2,062	20	86,240	18,271	28,167	49	36	85	1,067	47,675	61,451	48,887	—	1,445
14. Forfar	238,145	10,263	31,690	50,976	419	679	24	94,072	17,500	34,035	45	51	52	896	52,579	79,975	26,023	2	554
15. Haddington	115,364	7,940	19,586	15,746	36	1,416	78	44,719	9,885	14,796	38	222	174	591	25,656	27,914	16,000	—	1,075
16. Inverness	125,152	82	7,667	30,394	879	9	41	39,072	8,038	10,943	2	2	7	141	19,133	27,762	38,263	4	948
17. Kincardine	120,207	602	12,893	30,434	81	488	23	44,521	3,549	18,575	—	25	6	581	22,554	47,150	5,836	2	164
18. Kinross	31,262	137	1,576	5,569	8	14	1	7,305	884	2,806	—	2	21	68	3,781	12,524	7,630	—	13
19. Kirkcudbright	174,713	321	769	31,030	35	213	1	32,369	2,269	14,419	96	44	264	69	17,161	58,159	66,870	—	154
20. Lanark	245,575	4,205	601	42,984	68	1,725	32	49,615	8,700	9,164	75	71	391	1,259	19,660	65,813	109,691	5	791
21. Linlithgow	59,578	1,661	5,305	10,143	22	818	1	17,950	2,474	4,108	18	—	10	294	6,904	14,479	19,702	4	239
22. Nairn	26,252	10	2,715	6,065	351	—	16	9,157	710	4,087	1	—	4	43	4,845	10,052	2,184	—	14
23. Orkney	102,204		5,400	31,254	—	2	35	36,691	3,035	13,241	2	—	56	313	16,647	29,589	18,289	—	988
24. Shetland	58,254	—	2,687	8,070	—	—	—	10,757	2,683	846	—	—	267	—	3,796	766	41,814	—	1,121
25. Peebles	41,979	—	1,363	9,002	11	1	28	10,405	800	5,044	—	—	246	127	6,217	14,085	11,243	—	29
26. Perth	343,369	8,732	24,882	67,344	270	3,374	119	104,721	19,294	30,987	35	16	93	1,074	51,499	100,962	88,993	—	2,194
27. Renfrew	96,955	3,245	243	13,301	5	477	7	17,278	5,248	2,219	96	15	148	225	7,946	17,798	50,481	—	482
28. Ross & Cromarty	128,818	2,488	12,859	30,925	1,050	22	94	46,938	9,626	16,424	20	—	10	730	26,810	54,800	19,489	—	781
29. Roxburgh	178,814	1,030	16,797	33,266	121	520	62	51,756	2,042	26,475	77	10	446	550	29,600	56,557	40,651	—	250
30. Selkirk	28,228	26	704	4,392	1	1	—	5,121	187	2,761	—	—	158	41	3,147	7,857	7,100	—	18
31. Stirling	113,124	3,242	4,713	18,708	12	3,348	23	30,046	4,310	4,674	14	12	65	441	9,516	25,669	46,288	51	1,634
32. Sutherland	49,441	27	2,268	7,899	87	—	44	10,235	1,929	3,252	1	—	19	46	5,227	7,647	6,102	—	260
33. Wigtown	145,620	2,749	3,660	31,477	88	516	—	38,481	2,234	15,601	463	176	55	145	18,674	55,548	32,468	—	449
Total	4,713,159	76,613	278,584	1,004,535	7855	21,693	1255	1,390,535	174,743	491,964	2,480	1,883	4,853	15,456	690,879	1,450,951	1,159,387	73	21,334

TABLE No. 2.—Number of Horses, Cattle, Sheep, and Pigs, in each County of Scotland.

Counties.	Horses (including Ponies).			Cattle.				Sheep.			Pigs.
	Used solely for Agriculture, &c.	Kept solely for Breeding.	Total.	Cows and Heifers in Milk or in Calf.	Other Cattle.		Total.	1 Year Old and above.	Under 1 Year.	Total.	
					2 years of Age and above.	Under 2 Years of Age.					
1. Aberdeen	20,143	6,638	27,071	12,041	40,799	73,236	126,076	105,053	35,909	140,962	7,765
2. Argyll	4,085	3,517	7,602	22,622	16,396	21,296	60,314	718,367	274,802	993,169	3,935
3. Ayr	6,181	2,889	9,070	44,070	14,764	30,132	88,966	217,289	125,958	343,247	12,922
4. Banff	6,391	1,800	8,191	12,726	6,809	21,535	41,070	33,177	16,119	49,296	3,243
5. Berwick	4,138	1,229	5,367	3,471	4,249	7,746	15,466	155,326	112,503	267,829	4,249
6. Bute	790	423	1,213	3,175	1,644	2,747	7,566	27,134	13,361	40,495	678
7. Caithness	3,893	1,416	5,309	6,764	3,445	9,413	19,622	65,104	26,881	91,985	1,491
8. Clackmannan	501	179	680	1,385	946	1,325	3,656	6,891	3,449	10,340	1,391
9. Dumbarton	1,244	651	1,895	6,540	2,272	3,558	12,370	47,334	22,430	69,764	737
10. Dumfries	5,345	2,258	7,603	16,464	13,792	21,915	52,171	321,663	164,217	485,880	10,013
11. Edinburgh	3,359	824	4,183	10,420	3,942	4,168	18,520	103,822	63,113	166,935	5,287
12. Elgin	4,033	1,121	5,154	6,807	4,393	11,932	23,132	33,983	15,802	49,785	2,897
13. Fife	7,792	2,464	10,256	9,015	12,519	15,478	37,012	46,479	27,250	73,729	5,438
14. Forfar	8,365	2,077	10,442	11,394	15,088	17,784	44,566	88,733	35,738	124,471	5,987
15. Haddington	3,241	577	3,818	1,845	3,666	2,685	8,205	66,108	42,564	108,672	2,485
16. Inverness	6,735	2,093	8,828	20,203	9,070	21,480	50,753	518,237	178,122	696,359	2,990
17. Kincardine	3,950	1,028	4,978	6,776	6,615	12,152	25,543	24,058	8,936	32,994	2,401
18. Kinross	717	303	1,020	1,078	1,688	2,634	5,400	17,080	10,104	27,184	463
19. Kirkcudbright	3,778	1,842	5,620	11,884	12,460	15,314	39,608	246,137	116,989	363,126	5,009
20. Lanark	5,619	2,406	8,025	33,844	11,994	20,191	66,029	140,139	76,360	216,799	6,297
21. Linlithgow	1,612	606	2,218	3,647	3,074	3,575	10,296	15,285	6,710	21,995	1,650
22. Nairn	966	274	1,240	1,763	975	3,331	6,069	14,488	4,456	18,944	712
23. Orkney	4,568	1,367	5,935	8,913	4,156	11,681	24,750	15,474	11,892	27,366	3,939
24. Shetland	975	4,676	5,651	8,145	6,375	6,174	20,694	54,544	30,091	84,635	4,225
25. Peebles	895	261	1,156	2,027	1,118	2,819	5,964	117,512	75,487	192,999	737
26. Perth	10,817	3,358	14,175	19,552	20,535	33,624	73,711	172,640	199,840	672,480	8,684
27. Renfrew	2,235	1,007	3,242	14,846	3,722	6,137	24,675	19,727	11,006	30,733	1,482
28. Ross and Cromarty	5,571	1,708	7,279	17,398	8,715	15,574	41,687	218,657	89,770	338,427	6,144
29. Roxburgh	3,762	797	4,559	4,763	5,148	6,629	16,540	284,927	212,765	497,692	3,352
30. Selkirk	472	80	552	946	537	876	2,359	94,798	62,400	157,198	373
31. Stirling	3,198	1,562	4,760	9,721	9,158	10,357	29,236	71,716	39,345	111,061	1,720
32. Sutherland	2,105	524	2,629	5,582	2,248	4,513	12,343	168,893	40,520	209,413	1,157
33. Wigtown	4,019	2,007	6,026	18,630	7,425	13,177	39,232	78,320	43,814	122,134	7,868
Total,	141,785	53,962	195,747	388,686	259,727	435,188	1,083,601	4,639,395	2,198,703	6,838,098	127,721

TABLE No. 3.—Quantities and Values of the Imports of Live Cattle, Sheep, and Swine, 1874 to 1878.

	Quantities.					Values.				
	1874.	1875.	1876.	1877.	1878.	1874.	1875.	1876.	1877.	1878.
	No.	No.	No.	No.	No.	£	£	£	£	£
Live Cattle,	193,862	263,684	271,576	201,193	253,462	3,296,460	4,885,462	4,860,440	3,817,499	5,080,702
Live Sheep,	758,915	985,652	1,041,329	874,055	892,125	1,610,355	2,185,750	2,226,952	2,107,466	2,171,904
Live Swine, including Sucking Pigs,	115,389	72,170	43,558	20,037	55,911	358,226	255,076	172,727	87,599	200,703
Total,	1,068,166	1,321,506	1,356,463	1,095,285	1,201,498	5,265,041	7,326,288	7,260,119	6,012,564	7,453,309

TABLE No. 4.—Quantities and Values of the Imports of Beef and Pork (Salted), Bacon and Hams, &c., 1874 to 1878.

	Quantities.					Values.				
	1874.	1875.	1876.	1877.	1878.	1874.	1875.	1876.	1877.	1878.
	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.	£	£	£	£	£
Meat—										
Beef, salted,	226,928	180,638	241,083	209,618	220,816	434,817	357,201	476,020	410,251	420,077
Beef, fresh or slightly salted,	54,793	34,943	172,268	468,887	508,307	88,509	97,136	467,360	1,276,141	1,340,285
Unenumerated, salted or fresh,	149,403	144,954	92,556	130,178	145,981	335,846	419,019	281,830	388,933	428,064
,, preserved other than salted,	265,223	171,373	283,066	469,003	439,900	757,001	592,196	887,035	1,434,284	1,315,701
Pork, salted and fresh,	322,574	266,663	378,607	303,734	389,439	704,435	590,356	840,739	608,249	659,462
Bacon and Hams,	2,542,095	2,638,875	3,181,569	2,820,482	4,295,151	5,902,429	6,982,470	8,611,329	6,889,354	8,660,310
Total,	3,511,016	3,437,446	4,349,149	4,401,902	5,999,594	8,223,037	9,038,378	11,534,513	11,007,162	12,838,899
	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.	£	£	£	£	£
Fish,	661,406	840,090	966,119	1,071,802	995,933	981,950	1,266,577	1,450,974	1,640,259	1,541,830
Poultry and Game (see Value)	. .	. .	. .	. .	. .	270,264	328,044	297,018	319,994	403,924
Butter,	1,619,808	1,467,870	1,659,402	1,637,403	1,796,517	9,050,025	8,502,084	9,718,226	9,543,332	1,787,874
Cheese,	1,485,265	1,627,748	1,551,204	1,653,920	1,968,859	4,483,927	4,709,508	4,237,763	4,771,393	9,994,053
Lard,	374,328	540,244	562,174	592,264	908,605	884,596	1,634,769	1,579,721	1,471,829	4,046,086
Eggs, Number,	680,552,280	741,223,560	753,026,040	751,185,600	783,714,720	2,433,134	2,559,850	2,630,456	2,473,377	2,511,096
Total,	. .	. .	. .	. .	. .	18,103,896	19,000,842	19,913,098	20,220,184	21,144,563

TABLE No. 5.—Quantities and Values of the Imports of Wheat and Wheat Flour, 1874 to 1878.

	QUANTITIES.					VALUES.				
	1874.	1875.	1876.	1877.	1878.	1874.	1875.	1876.	1877.	1878.
	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.	£	£	£	£	£
Wheat,	41,527,638	51,876,517	44,454,657	54,269,800	49,906,484	25,236,932	27,510,469	23,178,011	33,885,437	27,433,444
Wheat Flour,	6,236,044	6,136,083	5,959,821	7,377,303	7,828,079	5,685,076	4,870,257	4,741,515	6,808,982	6,784,197
Total,	47,763,682	58,012,600	50,414,478	61,647,103	57,734,563	30,922,008	32,380,726	27,919,526	40,694,419	34,217,641

TABLE No. 6.—Quantities and Values of the Imports of Barley, Oats, Rye, Meal, and Malt, 1874 to 1878.

	QUANTITIES.					VALUES.				
	1874.	1875.	1876.	1877.	1878.	1874.	1875.	1876.	1877.	1878.
	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.	£	£	£	£	£
Barley,	11,335,396	11,049,476	9,772,945	12,959,526	14,156,919	5,291,287	4,635,644	3,747,685	5,396,019	5,542,503
Oats,	11,387,768	12,435,888	11,211,019	12,910,035	12,774,420	5,116,732	5,406,758	4,620,450	4,992,879	4,557,665
Indian Corn,	17,693,625	20,438,480	39,963,369	30,477,818	41,073,906	7,482,720	8,119,957	12,762,092	9,854,512	12,595,402
Peas and Beans,	4,186,698	5,073,909	6,218,805	6,110,985	3,696,300	1,964,164	2,314,424	2,561,352	2,331,139	1,468,146
Rye,	470,018	310,013	132,366	241,269	342,395	197,736	125,855	45,653	96,232	125,291
Buckwheat,	67,519	118,168	37,759	61,424	45,813	27,483	42,420	13,281	23,006	16,067
Total.	45,141,024	49,425,934	67,336,243	62,761,057	72,689,753	20,080,122	20,645,058	23,750,513	22,693,787	24,305,074
	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.	£	£	£	£	£
Barley Meal,	—	227	821	511	485	—	109	328	231	166
Oatmeal,	41,176	56,502	166,681	153,418	762,088	33,504	41,911	106,847	108,880	485,888
Indian Meal,	7,296	7,376	7,703	2,713	41,747	13,636	12,080	15,471	17,264	32,276
Rye Meal,	3,921	5,414	17,115	47,463	56,322	1,923	2,391	6,820	17,624	20,986
Pea Meal and Bean Meal,	683	—	267	16	995	287	—	139	12	442
Buckwheat Meal,	59	20	33	16	16	71	24	50	22	18
Meal unenumerated,	39,994	13,479	32,255	8,896	5,711	18,651	4,392	12,744	4,083	2,384
Total.	93,130	83,018	224,875	213,033	867,364	68,072	60,907	142,399	148,116	542,160

TABLE No. 7.—Average Prices of various kinds of Animals, Dead Meat, and Provisions, 1874 to 1878.

Kinds of Animals, Dead Meat, &c.	1874.	1875.	1876.	1877.	1878.
Animals—Oxen and Bulls from Schleswig-Holstein and Holland, ... each	£19 19 9	£18 10 7	£17 17 11	£18 19 6	£22 12 2
„ Sheep, including lambs, from Holland, „	2 2 5	2 4 4	2 2 9	2 8 3	2 8 8
Bacon—From all countries, . . . per cwt.	2 5 9	2 12 3	2 13 6	2 7 10	1 18 7
Hams—From all countries, . . . „	2 15 2	2 19 5	2 19 9	2 13 11	2 8 1
Beef, salted—From all countries, . . . „	1 18 4	1 19 6	1 19 6	1 19 2	1 18 1
„ Admiralty prices { American, . „	2 9 $3\frac{1}{4}$	2 9 $4\frac{1}{2}$	2 6 $0\frac{1}{2}$	2 8 4	—
„ Admiralty prices { Deptford. „	3 8 $0\frac{1}{2}$	3 4 $9\frac{1}{4}$	3 7 $4\frac{1}{2}$	3 10 $4\frac{3}{4}$	—
Pork, salted—From all countries, . . „	2 2 9	2 3 2	2 2 0	1 19 7	1 13 1
„ Admiralty prices. . . „	3 5 $11\frac{3}{4}$	3 6 2	3 7 $10\frac{1}{4}$	3 3 $3\frac{1}{4}$	2 15 $5\frac{1}{2}$
Butter—From all countries, . . „	5 11 9	5 15 10	5 17 1	5 16 7	5 10 9
Cheese—From all countries, . . „	3 0 5	2 17 10	2 15 4	2 17 8	2 10 3
Potatoes—From all countries, „	0 5 2	0 4 6	0 5 9	0 5 11	0 5 6
Eggs—From France, . . . per 120	0 8 7	0 8 3	0 8 4	0 7 11	0 7 8
Lard—From United States, . . . per cwt.	2 7 3	3 0 6	2 16 3	2 9 8	1 19 4
Milk—Bethlehem Hospital prices, . . per gallon	0 1 3	0 1 3	0 1 3	0 1 3	0 1 3

TABLE No. 8.—Average Prices (per Imperial Quarter) of Home-grown Wheat, Barley, and Oats in the Weekly Market of Edinburgh for the Years 1875, 1876, 1877, 1878, and 1879.

Month	Weekly Market day Wednesday.	WHEAT.										BARLEY.										OATS.									
		1875.		1876.		1877.		1878.		1879.		1875.		1876.		1877.		1878.		1879		1875.		1876.		1877.		1878.		1879.	
		s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
January	1	43	3	42	6	45	11	55	1	39	2	40	2	34	0	34	10	33	3	33	10	29	1	27	9	25	6	27	7	21	6
	2	41	9	42	5	48	2	55	8	38	0	40	3	35	6	35	0	33	11	33	3	29	3	27	0	27	2	28	4	21	8
	3	40	4	42	6	45	8	49	0	40	4	39	8	35	3	34	6	34	11	32	9	29	4	27	8	26	7	28	3	22	0
	4	39	8	45	1	45	6	44	10	38	3	39	2	33	11	34	8	33	8	34	2	28	5	27	6	26	9	28	7	22	1
	5	.	.	.	.	43	4	45	3	.	.	.	.	.	.	35	0	32	7	.	.	.	.	.	.	27	1	28	7	.	.
February	1	39	3	43	5	42	5	42	5	38	0	38	6	33	8	33	11	31	5	34	3	28	3	27	3	27	1	28	3	21	10
	2	40	6	42	8	41	2	43	4	37	6	37	8	33	1	34	4	32	4	34	3	28	8	28	0	26	0	28	10	21	8
	3	39	3	41	2	42	6	39	6	38	6	37	0	32	8	34	7	31	10	34	10	29	0	28	0	28	1	28	3	22	1
	4	39	8	40	7	45	5	42	7	38	6	37	0	32	0	34	3	32	3	35	8	29	3	29	3	27	2	29	4	22	1
March	1	39	0	41	10	44	7	41	10	38	4	38	2	32	5	35	4	32	6	35	10	29	0	29	5	27	8	30	11	23	1
	2	40	11	39	0	46	9	43	3	39	9	38	8	32	3	36	11	32	1	38	4	30	1	29	0	28	5	31	0	22	8
	3	41	3	38	3	45	11	43	5	40	0	39	5	32	7	38	1	34	5	37	5	30	6	30	2	28	7	31	8	22	11
	4	41	10	43	5	49	4	44	0	42	0	40	5	33	8	37	7	33	1	37	7	31	1	30	0	28	10	30	11	23	7
	5	42	7	40	10	.	.	.	.	.	.	40	0	35	8	.	.	.	.	.	.	31	6	30	11	.	.	.	.	.	.
April	1	43	10	43	8	48	0	46	5	42	5	40	3	36	4	36	0	33	2	38	4	31	10	29	2	29	3	31	11	24	4
	2	43	9	45	2	51	4	46	3	42	0	39	7	37	3	37	9	31	8	36	8	32	8	29	3	28	6	32	9	23	5
	3	43	2	45	9	43	7	46	4	41	10	38	11	36	4	37	9	34	10	37	4	32	11	29	9	29	7	32	5	23	2
	4	42	2	45	11	60	5	46	6	42	2	38	8	37	1	38	6	32	9	38	5	32	3	29	8	29	8	32	0	23	8
	5	.	.	.	.	.	.	.	.	41	6	.	.	.	.	.	.	.	.	37	0	.	.	.	.	.	.	.	.	24	6
May	1	41	4	45	0	63	7	46	1	42	1	37	10	37	6	37	5	31	10	36	6	32	9	30	5	31	8	31	5	24	2
	2	41	7	45	2	62	4	43	9	42	11	37	2	35	8	37	3	30	5	34	4	32	3	30	10	30	10	31	7	24	8
	3	41	4	47	1	61	1	43	4	41	9	34	11	34	5	37	8	31	6	34	7	32	6	30	4	30	6	31	6	23	8
	4	41	3	47	9	57	0	41	11	42	10	34	8	35	6	36	8	30	9	36	0	32	10	31	3	30	1	31	5	24	2
	5	.	.	47	8	57	1	41	11	.	.	.	.	35	8	30	4	28	5	.	.	.	.	32	5	30	2	31	10	.	.
June	1	42	0	47	0	58	6	37	4	41	6	33	2	36	7	33	10	29	9	33	4	32	11	32	4	30	7	32	3	24	3
	2	41	4	48	4	58	9	42	6	41	11	32	5	35	1	34	7	29	5	37	3	33	3	33	1	30	5	30	11	24	2
	3	42	9	48	1	53	6	36	7	41	5	34	1	36	4	34	2	30	2	37	0	33	3	32	2	30	4	31	7	24	7
	4	42	2	47	6	55	0	39	2	41	2	32	9	34	8	33	8	29	3	36	10	32	9	31	8	29	3	30	11	25	2
	5	42	8	.	.	.	.	.	.	.	.	35	1	.	.	.	.	.	.	.	.	33	4	.	.	.	.	.	.	.	.
July	1	41	11	47	3	56	6	36	0	43	5	32	9	32	11	34	2	29	0	35	8	32	6	31	7	29	7	31	2	24	10
	2	43	3	46	8	58	1	35	11	43	9	32	7	33	6	33	1	25	6	36	9	32	10	31	4	30	3	31	2	25	8
	3	47	1	44	5	59	3	38	8	44	8	30	0	33	2	29	8	26	11	35	2	33	5	30	4	30	3	31	7	25	11
	4	46	5	44	6	62	4	37	11	47	5	.	.	34	2	34	5	27	6	34	4	34	7	31	0	30	8	31	2	26	6
	5	.	.	.	.	.	.	.	.	48	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	27	8
August	1	47	6	43	11	57	10	38	4	48	0	37	6	32	10	33	10	27	9	38	2	34	4	31	0	30	2	30	6	28	2
	2	50	8	44	9	59	0	39	4	46	11	36	0	34	5	33	3	26	7	31	8	34	7	31	4	31	4	30	8	28	4
	3	48	2	43	7	58	4	38	10	45	10	34	6	34	2	34	11	26	8	.	.	34	8	31	3	31	4	30	5	29	1
	4	48	4	42	4	58	2	37	9	46	8	36	0	34	8	35	3	25	1	35	0	34	3	30	8	30	7	30	3	29	6
	5	.	.	41	8	59	3	38	11	.	.	.	.	34	9	34	8	32	6	.	.	.	.	33	4	32	1	30	5	.	.
September	1	48	0	46	3	58	11	38	4	44	11	35	0	36	5	38	11	31	8	40	3	32	5	32	9	32	7	31	4	29	6
	2	47	2	45	2	60	6	38	11	45	11	36	2	36	10	31	7	35	7	.	.	31	6	31	0	32	6	29	11	29	10
	3	40	6	46	2	60	9	37	10	46	9	36	10	35	3	30	2	35	11	.	.	31	2	29	10	31	0	27	1	29	4
	4	46	11	46	0	60	8	38	4	50	8	36	3	34	2	36	1	35	7	36	4	30	10	28	5	30	5	25	4	28	1
	5	48	5	.	.	.	.	.	.	.	.	34	6	.	.	.	.	.	.	.	.	30	1	.	.	.	.	.	.	.	.
October	1	48	5	46	7	60	10	44	4	52	9	36	0	34	1	34	7	34	7	34	1	29	3	27	3	30	7	25	2	25	8
	2	49	1	47	6	60	4	36	6	54	0	35	4	33	8	32	10	35	4	37	2	29	1	27	10	29	5	24	9	28	4
	3	51	3	46	4	62	7	36	5	55	9	36	11	34	8	34	3	33	5	34	10	29	4	27	6	31	2	26	5	26	8
	4	50	4	49	4	60	3	39	7	59	0	38	4	35	10	31	3	36	4	35	10	29	2	28	10	30	0	24	11	26	10
	5	.	.	.	.	57	10	38	6	56	7	.	.	.	.	32	1	35	0	32	5	.	.	.	.	30	4	25	10	26	4
November	1	49	4	47	6	63	4	40	2	53	6	37	7	36	0	32	8	33	8	31	3	29	11	30	0	29	8	25	3	24	9
	2	51	3	47	0	59	4	40	6	43	11	36	7	36	6	32	0	34	9	30	6	29	1	28	10	29	3	24	9	25	2
	3	48	11	47	0	56	6	39	1	53	7	36	2	36	0	32	6	34	9	30	3	28	3	28	4	28	10	23	6	25	0
	4	48	11	44	8	51	7	39	6	47	6	34	10	34	7	33	1	34	8	29	7	27	2	27	5	29	3	22	6	23	5
	5	.	.	46	2	.	.	.	.	.	.	.	.	36	0	.	.	.	.	.	.	.	.	27	4	.	.	.	.	.	.
December	1	48	5	46	7	53	9	40	2	42	0	35	3	34	11	32	8	36	7	30	8	27	11	27	5	28	5	21	9	24	5
	2	45	3	48	2	49	4	41	8	45	6	34	5	34	3	32	6	34	4	34	1	27	7	27	6	27	7	22	8	23	11
	3	46	10	46	11	48	11	40	2	49	10	35	0	34	9	32	2	33	11	33	3	27	7	26	7	26	7	21	7	24	1
	4	45	4	47	6	52	0	40	0	47	5	34	6	34	7	32	3	33	3	33	8	26	10	27	11	28	3	21	5	25	8
	5	43	3	.	.	.	.	40	2	49	8	34	0	.	.	.	.	33	3	32	2	27	6	.	.	.	.	21	7	26	9

APPENDIX (A).

PROCEEDINGS AT BOARD MEETINGS.

MEETING OF DIRECTORS, 5TH FEBRUARY 1879.

Present.—Lord Polwarth; the Hon. George Waldegrave Leslie; Sir Michael R. Shaw Stewart of Blackhall, Bart.; Sir James Ramsay Gibson Maitland of Clifton Hall, Bart.; Mr Dickson of Corstorphine; Mr Dingwall, Ramornie; Mr Gillon of Wallhouse; Mr Hog of Newliston; Mr Hope, Duddingston; Mr Irvine of Drum; Mr Kirkwood, Killermont; Mr Mackenzie of Portmore; Mr Murray of Dollerie; Mr Oswald of Dunnikier; Mr Ralston, Glamis; Mr Ritchie of Middleton; Mr Smith, Whittinghame; Mr Smith, Stevenson Mains; Captain Tod of Howden; Mr Wightman of Courance; and Dr Aitken—Mr Gillon of Wallhouse in the chair.

Mr F. N. MENZIES reported apologies for the absence of the Marquis of Lothian; Admiral Maitland Dougall of Scotscraig; Mr Ferguson, Kinnochtry; Mr Hendrie of Larbert; Mr Kennedy of Sundaywell; Mr Mylne, Niddrie Mains; Mr Walker, C.B., of Bowland; Professor Wilson; and Mr Young of Cleish.

ADDRESS TO THE QUEEN.—The Secretary stated that the address of condolence to the Queen had been forwarded to General Ponsonby on the 15th, and that the following reply had been received:—

"Osborne, January 17, 1879.

Sir,—I have duly laid before the Queen the resolution of condolence forwarded by you. I am commanded by Her Majesty to ask you to convey to the Marquis of Lothian, president of the Society, and to the members of the Highland and Agricultural Society of Scotland, the Queen's heartfelt thanks for their kind and cordial expressions of sympathy with Her Majesty on the occasion of the death of her dear daughter, Princess Alice, Grand Duchess of Hesse.—I have the honour to be, Sir, your obedient servant. (Signed) HENRY F. PONSONBY.

"(Addressed) F. N. Menzies, Esq."

THE LATE MARQUIS OF TWEEDDALE.—A letter was read from the Marchioness of Tweeddale conveying her warmest thanks to the president and members of the Society for, and her deep sense and appreciation of, the kind and touching resolution they had recorded of the late Marquis of Tweeddale; also for their expressions of condolence with her in her sad bereavement.

DUMFRIES SHOW.—Letters were read from the Earl of Galloway and from Mr Vans Agnew of Barnbarroch, M.P., acknowledging the votes of thanks passed at last general meeting.

CIRCUIT OF SOCIETY'S ANNUAL SHOWS.—It was remitted to the Committee on General Shows to suggest the names of members to the Directors to act on the Committee to consider the question of the circuit of the annual shows in future, it being understood that two members from each of the eight present districts and a director from each would be nominated.

GENERAL MEETING AT ANNUAL SHOWS.—It was also remitted to the General Show Committee to make the necessary arrangements for holding the meeting on the occasion of the Perth Show—the feeling of the Board being that the meeting should be held in the yard, and on the second or third day of the show.

CHEMICAL DEPARTMENT—*Analysis.*—The remit from last general meeting to the Directors to consider how members of the Society can be put in possession of the advantages at present given through local associations with a greater guarantee of correctness, was referred to the Committee in charge of the Chemical Department.

Aberdeen School of Chemistry.—On an application by Colonel Innes of Learney, the Board agreed to give a donation of £25 for this year in aid of the School of Chemistry and Agriculture established in Aberdeen.

TRANSACTIONS—*Prize Essay System.*—It was remitted to the Publication Committee to suggest the names of members, composed of Directors and others, to consider and report whether any change in the present mode of procuring papers

for publication can be introduced with advantage, in terms of the resolution of last general meeting. *Gaelic Manuscripts.*—The Secretary reported that the curators of the Advocates' Library had presented to the Society a list of the Gaelic manuscripts belonging to the Society, which were some years since deposited for preservation in their library. The catalogue had been prepared by Mr W. F. Skene, W.S., and the curators had included in the list a catalogue of the manuscripts belonging to the Faculty of Advocates.

The SECRETARY stated that he had already, in name of the Board, thanked the curators for the catalogue.

STALLION COMPETITION AT PERTH.—The Board had before them and fully considered the advertisement issued by the Committee appointed to take charge of the stallion competition at Perth, when, after considerable discussion, it was resolved to instruct the Secretary to inform the Convener of the Committee that that part of the advertisement referring to committees attending the show to select horses to travel their districts must be immediately cancelled, and an advertisement to that effect issued at once.

FAMILY PRIZES FOR SHORTHORNS.—It was resolved that a family prize for shorthorns should be given at the general show at Kelso in 1880—each entry to consist of a cow and two of her descendants, male or female.

FINANCE.—The SECRETARY stated that (in consequence, he believed, of a notice in the *Gazette* made by a member of the Society disclaiming membership) he had received some applications inquiring if the holding of bank stock by the Society involved the members in personal liability.

The Directors instructed the Secretary to insert in the newspaper report of this day's meeting the following statement:—"That the Society is incorporated by royal charter, and that the only obligation thereby imposed on members is payment of their subscription; that it had been announced from the bench of the Court of Session that 'a corporation, being a separate person, has its own estate and its own liabilities, and the corporators (members) are not liable *for* the corporation, but only *to* the corporation within the limit of the obligation they have undertaken to subscribe to the corporate funds;' members, therefore, are liable for nothing beyond their subscriptions."

COMMITTEES FOR 1879.—The various committees for the current year were arranged.

VETERINARY DEPARTMENT.—The agreement between the Society and the Royal College of Veterinary Surgeons referred to at the general meeting on the 15th January 1879 was submitted.

ARGYLL NAVAL FUND—*Promotion of Sub-Lieutenant Montgomerie.*—A letter was submitted from Mrs Montgomerie intimating that her son, Mr R. A. J. Montgomerie, had been appointed by the Queen to her own yacht, and had got his lieutenancy in September last, one year before the usual time, on account of special services, in consequence of which promotion another vacancy occurs in the Argyll Naval Fund.

MEETING OF DIRECTORS, 5TH MARCH 1879.

Present—Lord Polwarth; the Hon. George Waldegrave Leslie; Sir Michael R. Shaw Stewart of Blackhall, Bart.; Sir James Ramsay Gibson Maitland of Clifton Hall, Bart.; Mr Dickson of Corstorphine; Mr Dingwall, Ramornie; Mr Gillon of Wallhouse; Mr Hope, Duddingston; Mr Irvine of Drum; Mr Kirkwood, Killermont; Mr Mackenzie of Portmore; Mr John Ord Mackenzie of Delphinton; Mr Murray of Dollerie; Mr Oswald of Dunnikier; Mr Smith, Whittinghame; Mr Smith, Stevenson Mains; Mr Seton Wightman of Courance; Mr Young of Cleish—Mr Gillon in the chair.

Mr F. N. MENZIES reported apologies for the absence of Mr Mylne, Niddrie Mains; and Mr Ralston, Glamis.

Before proceeding with the business on the programme, the following resolutions were unanimously agreed to:—

DEATH OF MR HUNTER OF THURSTON.—The death of Mr James William Hunter of Thurston having been communicated to the Directors of the Highland and Agricultural Society of Scotland, they resolved to record in their minutes their sincere sorrow for his loss, and their sense of the obligations which the Society owes to him as a director, a member of the Council on Education, and as chairman of the Society's Machinery Committee; and for the deep interest he took in the welfare of the Society.

DEATH OF MR CURROR, THE LEE.—That the Directors of the Highland and Agricultural Society of Scotland desire to express their deep regret at the loss

which the Society has sustained by the death of Mr Adam Curror of The Lee, and their sense of the assistance rendered by him as a director and a member of Committee.

Circuit of the Society's Annual Shows.—The Directors approved of the names suggested by the Standing Committee on General Shows to act on the Special Committee on the Circuit of the Society's Annual Shows, and added Mr Gillon of Wallhouse, chairman of the General Show Committee, who was named convener of the Committee.

Competition of Stallions at Perth.—The Secretary reported that the competition of stallions for agricultural purposes for the premium of £150 offered by the Society for the best stallion to serve this season in the district of the Perth Show, took place at Perth on the 14th of February, when thirty-eight horses were entered. The judges—Messrs Gray, Muncraig, Kirkcudbright; Smith, Stevenson Mains, Haddington; and Wilson, Leithen Hall, Wamphray—awarded the premium to Mr David Riddell, Blackhall, Paisley, for his stallion "Luck's All." The district comprises the eastern division of Perthshire, western division of Forfarshire, Fifeshire, and Kinross-shire.

Shorthorn Entries.—It was resolved that in future all shorthorn animals exhibited at the Society's Annual Shows must be entered in the Herd-Book, or the exhibitor must produce a certificate from the Council of the Shorthorn Society that his animal is eligible to be entered therein.

Exhibition of Implements at Perth.—In accordance with a desire strongly urged on the General Show Committee by a deputation from the Scottish Agricultural Engineers' Association, at a meeting held on the 19th February, the Board resolved to withdraw all premiums and medals for implements and machinery, and to open the implement yard at Perth to exhibitors of implements of agriculture, horticulture, and forestry, and other implements and collections of articles not agricultural, but that there should be no trials or awards of any kind. The deputation consisted of—Mr Kemp, Stirling, chairman of the Association; Mr George Greig, of Messrs John Fowler & Co., Leeds; and Mr Main, of Messrs A. & J. Main & Co., Glasgow.

General Meeting at Perth.—The Board resolved, agreeably with the report by the Committee on General Shows, that the general meeting at Perth should be held in the yard on the 30th July, at 1.30; and it was remitted to the Secretary to arrange with the contractor to have a suitable erection attached to the Committee Room.

Chemical Department.—The remit from the general meeting in January last to the Directors to consider how members of the Society can be put in possession of the advantages at present given through local associations, with a greater guarantee of correctness, was, at the meeting of the Board on the 5th of February referred to the Committee in charge of the Chemical Department. That Committee held a meeting on the 26th February, when the Secretary read a letter from Mr W. P. Hope, Leith, the mover of the motion at the general meeting, in which he stated that he believed the time had now arrived when the Society would confer a great boon upon its members by providing them with cheap and accurate analyses and reports upon manures and feeding stuffs, as also upon the various soils; and he suggested that this be done by the Society's chemist, the farmers paying the same rate into a fund towards his remuneration as they at present pay to the analytical associations with which they are connected, and that the chemist should be instructed to give valuations when asked for, in accordance with the general price lists of the day, but not otherwise. Mr Hope also suggested that a form drawn up from the various price lists be continually in the hands of the chemist, who could send the same to the farmers as the basis of valuation when required to make the same. The Committee reported that, being limited by the resolutions of former general meetings in regard to the expense of analyses, they see no way of furthering the object proposed by Mr Hope; but they thought it worthy of the consideration of the Board whether the chemist should not be authorised to make analyses at rates to be arranged sufficient to pay him; and that on his finding manures or feeding stuffs sold with a guarantee not coinciding therewith, within a certain limit, the name of the seller or manufacturer should be published, if deemed expedient, after the analysis has been submitted to him for explanation as to the discrepancy.

The Board unanimously approved of the suggestion, and remitted back to the Committee to make arrangements for carrying it out.

Transactions.—The remit from the last general meeting to the Directors to suggest the names of members, composed of directors and others, to consider and report whether any change in the present mode of procuring papers for publication can be introduced with advantage, was at the last meeting of the Board referred to the Publication Committee. At a meeting of the Committee held immediately before the Board met, the Secretary read a letter he had received from the Rev. Mr

Gillespie, the mover of the motion at the general meeting, when, after careful consideration, it was resolved to recommend the following as members of Committee :—Mr Irvine of Drum ; Mr Walker of Bowland, C.B.; Rev. John Gillespie, Mouswald Manse ; Mr R. Pillans Newton of Castlandhill ; Mr Scot Skirving ; Mr David Stevenson, C.E.; Professor Wilson.

The Board approved of the names suggested, and nominated Mr Irvine of Drum convener.

Cultivation of Willows.—The Secretary stated that the Report on the Cultivation of Willows, for which a gold medal was awarded at the general meeting in January last, would appear in the forthcoming volume of the Transactions ; and he read an interesting letter he had since received from the author, Mr William Scaling, dated 7th February 1879, relating the circumstances that led to his growing willows. When a very young man he opened a shop in George Street, Edinburgh, as a working basket-maker, and whilst there the excellent taste of the Edinburgh ladies urged him to attempt a more artistic style of manufacture, for which he had so much difficulty in procuring suitable willows that he decided on trying to grow them ; but not being able to get land near Edinburgh, he took a piece of ground in the county of Nottingham. By careful selection of cuttings at starting, and attention to other details, his willow-grounds speedily became the model willow farm in England. Taking more land he removed from Edinburgh to Basford, Notts, in 1852, and has since chiefly devoted himself to the willow cultivation as a speciality, and thus to the taste of the ladies of Edinburgh is due the merit of the medal now awarded.

Agricultural and Forestry Examinations.—The examination for the Society's agricultural certificates and diploma, and for the Society's certificates in forestry, were fixed for the 31st March and 1st and 2d April, candidates being required to lodge intimation on or before 15th March, with the Secretary, from whom further information may be obtained.

Veterinary Examinations.—An arrangement having been made with the Royal College of Veterinary Surgeons that the holders of the Society's veterinary certificates are to be admitted members of the Royal College, the Society is to cease holding examinations ; but, not to disappoint those students who may have entered the teaching schools with the view of taking the Society's certificate, the examinations will be continued till April 1881, in accordance with the former rules. The examination for the present year will take place about the middle of April. Candidates' names must be entered before the 31st of March, it being clearly understood that unless fifteen students enter their names, no examination will be held.

MEETING OF DIRECTORS, 2d APRIL 1879.

Present—The Hon. George Waldegrave Leslie ; Sir James Ramsay Gibson Maitland of Clifton Hall, Bart.; Mr Dingwall, Ramornie ; Mr Ferguson, Kinnochtry ; Mr Gillon of Wallhouse ; Mr Hope, Duddingston ; Mr Kennedy of Sundaywell, Brandleys ; Mr Mackenzie of Portmore ; Mr Mylne, Niddrie Mains ; Mr Murray of Dollerie ; Mr Ritchie of Middleton ; Mr Ross, Bachilton ; Mr Smith, Stevenson Mains ; Mr Smith, Whittinghame ; Mr Walker of Bowland, C.B.; Mr Seton Wightman of Courance ; Professor Wilson ; Mr Young of Cleish ; Dr Aitken—Mr Ferguson, Kinnochtry, in the chair.

Mr F. N. Menzies reported apologies for the absence of Lord Polwarth ; Mr Copland, Mill of Ardlethen ; Mr Dickson of Corstorphine ; Mr Irvine of Drum ; and Mr David Stevenson, C.E.

Letters were read from Mr Richard Hunter conveying his thanks to the Board for the minute of sympathy recorded towards his late uncle—Mr Hunter of Thurston ; and from Mr J. F. Curror, returning his thanks for the sympathy expressed on the occasion of the death of his late father—Mr Adam Curror of The Lee.

Chemical Department.—At the meeting of the Board on the 5th March, the suggestion contained in the minute of the Committee of the 26th of February as to the chemist being authorised to make analyses was approved of, and it was remitted back to the Committee to make arrangements for carrying it out. The Committee accordingly held a meeting on the 12th March, when it was suggested that the Directors should authorise Dr Aitken to act as analytical chemist to the Society, as well as chemist in charge of the agricultural stations. From the report it appeared that Dr Aitken produced to the Committee a leaflet containing the scale of charges now made by him, and which, he informed the Committee was the same as charged by other first-class analytical chemists in Scotland. The Committee recommended that the scale of charges be approved of by the Directors. A copy of it accompanied their report, and copies may be had either at the Society's Chambers, or direct from Dr Aitken, Chemical Laboratory,

Veterinary College, Clyde Street, Edinburgh. The Committee also suggested that in all cases where a member of the Society has submitted to the chemist of the Society a sample of the manure or feeding stuff, along with the written guarantee under which he purchased it, and upon analysis the said manure or feeding stuff is found not to coincide with the written guarantee within certain limits to be hereafter determined, the chemist shall forward the analysis to the seller for explanation, and shall report the case, along with the written guarantee, his analysis, and the explanation of the seller (if any), to the Directors for disposal. The Committee further suggested that publicity should be given to the proposed action, if adopted, and that, where necessary, the name of the defaulter should be published in the newspaper report of the Directors' meeting.

Dr AITKEN remarked that from various communications which he had received from farmers and manure merchants in various parts of the country, he believed that the action which was being taken by the Directors on this remit, from the general meeting would be very acceptable to members of the Society interested in this matter. He hoped, however, that it would be clearly understood that the Society, in dealing with this subject, had no desire whatever to interfere with the working of the various agricultural associations throughout the country, which had been very beneficial to farmers, and were doing good work in giving their members some control over the quality of the manures supplied to them, although there were frequent complaints regarding the secret, trades'-union-like manner in which this was done. He believed that in dealing with respectable manure merchants farmers were, on the whole, very fairly treated in regard to manures, and that the frequent reports to the contrary were much exaggerated. The most universal complaint was against the chemists themselves, who were often found to differ very widely in their analysis of the same sample of manure. Examples of this which had come under his notice were sufficient to shake the confidence of farmers in the value of chemical analysis, and to bring the profession into contempt. It was possible that the cause of these discrepancies might arise from inaccurate or careless methods of analyses; but his experience led him to think that they were mostly due to imperfect sampling. To obtain a perfectly fair sample of a manure from bulk was a difficult matter, and had to be gone about with great care. The common method of taking a handful of manure from the top of a certain number of bags was a bad one, since from the shaking and vibration during transit that part of the manure was often least liable to yield a fair sample of the whole. For the instruction of members he had written a few short directions upon this matter, which, if carefully carried out would, he believed, greatly diminish the causes of complaint regarding discrepant analyses. He had also prepared a few instructions with the view of enabling members unacquainted with chemistry to interpret the results of analyses of manures as usually supplied in analytical reports. He thought if these were considered in Committee, and received the approval of the Directors, they would be found very useful. There was another matter which he thought might be similarly dealt with, viz., the adoption of a series of units wherewith to value manures. It was no part of a chemist's business to value manures; but if an equitable series of units were fixed for the constituents of the various kinds of manures, and adjusted from time to time by the Committee, which was quite capable of undertaking that duty with such assistance as it had at its command, it would enable the chemist to affix to manures values which would be satisfactory alike to buyers and sellers.

Mr MACKENZIE of Portmore reported that he had been making various inquiries relative to how the matter should be carried out; and the Directors remitted back to the Committee to frame a plan of procedure, and report to next meeting.

AGRICULTURAL EDUCATION—*Diplomas and Certificates.*—A meeting of the Society's Council on Agricultural Education was held immediately after the Directors' meeting, when the report of the examiners was submitted, from which it appeared that the examination of candidates for the diploma and certificates in agriculture took place on the 31st March and 1st and 2d April, and resulted in five gentlemen passing for the diploma, two for first class, and three for second class certificates.

VETERINARY DEPARTMENT.—The SECRETARY intimated that the annual public examination of candidates for the Society's veterinary certificate would be held in the Society's Hall on Monday the 7th curt., and that the practical examination would take place the same day in Mr Buist's auction mart, Lauriston.

PERTH SHOW, 1879.—The Board approved of the usual letters to the conveners of the counties embraced in the district connected with the Show, and to the Lord Provost of Perth in regard to the appointment of the local committee. The numbers to be named by the different counties were arranged as follow:—Eastern division of Perthshire, 10; western division of Forfarshire, 8; Fifeshire, 10; Kinross-shire, 4; and city of Perth, 6.

KELSO SHOW, 1880.—Letters to the conveners of the counties connected with the Show, in regard to the auxiliary subscription, were submitted and approved.

POTATO PLANTERS.—The following report of the trial of potato planters, invented and made by Messrs G. W. Murray & Co., Banff, which took place on the farm of Niddrie Mains, Liberton, on the 28th March, was read :—The two-drill machine was tried both with whole seed (seconds) and cut seed potatoes. It did not work in a manner so as to enable the Committee to recommend it. The seed was not dropped equally, and a good many blanks left ; also, a cup chain gave way which put a stop to one of the sides working during the most of the trial. The one-drill machine was then thoroughly tested with both kinds of sets, and performed its work very well, so much so that in counting over a hundred sets dropped only two blanks were found. This machine had the advantage of the drop spout being much nearer the ground than the other, which enabled it to deposit the seed more regularly ; and the work was, upon the whole, satisfactorily done. The Committee think that the machine might be further improved, especially by altering the construction of the wheels in such a manner as to enable them to keep steadily on the top of the drills when at work. The price—£7, 7s—being moderate, and the mechanism strong and simple, and not likely to go out of order, the Committee feel justified in commending it, and recommend the Directors to award a medium gold medal.

The Board approved of the report, and the medal recommended was accordingly voted to Messrs G. W. Murray & Co., Banff, for their one-drill potato planter.

HALL AND CHAMBERS.—The Hon. GEORGE WALDEGRAVE LESLIE gave notice that at the meeting of the Directors on Wednesday the 7th May he would move :—" That it be referred to the Hall and Chambers Committee to consider the number of eligible houses in Edinburgh now in the market, and to report upon any really suitable house or houses for the offices of this Society, where also the Society's chemist may be able to carry out analysis of manures, feeding stuffs, &c., for the benefit of members of the Society, in the same manner as is now so efficiently carried out by the Royal Agricultural Society of England."

LECTURES ON AGRICULTURAL CHEMISTRY.—The SECRETARY intimated that the series of lectures delivered in the Society's Hall by Dr Aitken had been successfully completed. The lectures had been extremely instructive as well as entertaining ; and though fairly attended, he had hoped that many more of the agriculturists of the neighbourhood would have availed themselves of such an admirable opportunity of gaining useful information on chemistry as applied to agriculture.

The Board gave a cordial vote of thanks to Dr Aitken.

MEETING OF DIRECTORS, 7TH MAY 1879.

Present—Sir James R. Gibson Maitland of Clifton Hall, Bart. ; Mr Dingwall, Ramornie ; Mr Hope, Duddingston ; Mr Kennedy of Sundaywell ; Mr John Ord Mackenzie of Dolphinton ; Mr Mylne, Niddrie Mains ; Mr Ritchie of Middleton ; Mr Smith, Whittinghame ; Mr Young of Cleish Castle –Mr Mylne, Niddrie Mains, in the chair.

Mr F. N. MENZIES reported apologies for the absence of the Hon. George Waldegrave Leslie ; Mr Graham Binny, W.S.; Mr Dickson of Corstorphine ; Admiral Maitland Dougal of Scotscraig ; Mr Ferguson, Kinnochtry ; Mr Gillon of Wallhouse ; Mr Hendrie of Larbert ; Mr Irvine of Drum ; Mr Mackenzie of Portmore ; Mr Ralston, Glamis ; Mr Seton Wightman of Courance ; and Dr Aitken.

The following resolutions were submitted and unanimously agreed to :—

THE LATE DUKE OF ROXBURGHE, K.T.—" That the Directors of the Highland and Agricultural Society of Scotland desire to express the deep and sincere regret with which they have received the intimation of the death of their former president, his Grace the Duke of Roxburghe, K.T. That the Society having in the minutes of the general meeting held on 11th January 1853 recorded, on his Grace retiring from the office of president, their sense of the importance of the assistance which he had rendered to the Society, for the zeal exhibited in promoting its efficiency and prosperity, for his presence at the different shows, meetings, and public banquets, and for the alacrity and ability with which he had uniformly promoted the objects and interests of the Society—it only remains for the Directors to deplore the loss the Society and the country have now sustained by the death of one who had rendered such great services to the Society during the forty-two years his Grace was a member. That a copy of this resolution be transmitted to the Duke of Roxburghe, to be communicated to his mother, the Duchess Dowager, with the respectful condolence and sympathy of the Directors in her severe bereavement."

THE LATE CAPTAIN TOD OF HOWDEN.—" That the meeting cannot proceed to the ordinary business of the day without expressing the sense of the loss which the High-

land and Agricultural Society of Scotland has sustained by the untimely death of Captain R. A. B. Tod of Howden, who had filled the office of a director from 1870 to 1875, and had since 1872 rendered much valuable service to the Society as chairman of its Veterinary Committee, and who upon all occasions took a warm interest, not only in the veterinary department, but in all that concerned the welfare of the Society. That a copy of this resolution be transmitted to William Tod, Esq., of Heatherybaugh, the late Captain Tod's brother."

HALL AND CHAMBERS. The Hon. George Waldegrave Leslie, who gave notice of a motion at last Board meeting in regard to new premises, being unavoidably detained in London, the Directors, while approving of it, considered it desirable, in consequence of the opposition which was manifested at the general meeting in January 1876 to the Society's leaving its present hall, that Mr Leslie should himself bring forward his motion at the general meeting on the 18th of June.

GENERAL MEETING. The half-yearly general meeting of the Society, for the election of members and for other business, was fixed to be held on the 18th of June, being the first Wednesday after the closing of the entries for the Perth Show.

AGRICULTURAL EDUCATION. The following letter from the Science and Art Department to the Secretary, dated 28th April was read :—

"Sir,—With reference to your letter of the 8th inst., I am directed by the Lords of the Committee of Council on Education to state, for the information of the Highland and Agricultural Society of Scotland, that their Lordships have been pleased to allow holders of the diploma of the Society to earn payments on the results of their instruction in the principles of agriculture under this department without undergoing the usual examination. It will, however, be necessary for persons holding this certificate to make application to the department before commencing teaching, in accordance with section 35 of the Science Directory.—I am, Sir, your obedient servant.

(Signed) NORMAN MACLEOD."

VETERINARY DEPARTMENT.—The report of the examinations for the Society's veterinary certificate, which took place on the 7th and 8th April, was laid on the table, from which it appeared that six students presented themselves for the final examination, and that the whole had passed.

The preliminary examination of younger students was held at the same time, when 21 entered their names, and 14 passed.

CHEMICAL DEPARTMENT.—The Directors on the 2d of April remitted to the Chemical Committee to frame a plan of procedure in consequence of the recommendation that the chemist should be authorised to make analyses, at rates to be arranged sufficient to pay him. The Committee met on the 23d, and having carefully considered the subject, resolved to recommend—1st, That a table of simple but clear instructions for selecting and sending samples of artificial manures and feeding stuffs for analyses be prepared for the use of members of the Society. 2d, That this table be submitted to the next general meeting of the Society, and authority requested to the following course of action, viz.:—That when any member of the Society shall have purchased artificial manures or feeding stuffs under a written guarantee, and shall have submitted to the Society's analytical chemist a sample of such artificial manure or feeding stuffs, taken in accordance with the Society's instructions above referred to; and when, upon analysis, the Society's chemist shall discover that serious discrepancy exists between the actual constituents of the article so analysed and the supposed constituents as taken from the guarantee under which the article was purchased, he (the chemist) shall report such discrepancy in full detail to the Chemical Committee, and along with his report shall forward the invoice gurarantee, and any other documents he may have received in connection with the case, and any correspondence which may have passed between him and the vendor on the subject: that thereupon the Chemical Committee shall consider the whole circumstances of the case, and if it appears to them that in the interests of the Society and of agriculture generally the facts of the case and the name of the vendor should be published, they shall prepare a report and submit it to the Society's law agents for their opinion, and shall then submit their report, along with the opinion of the Society's law agents, to the Directors of the Society, who shall be empowered to deal with the matter in such way as they shall deem best. 3d, That a table of the current values at the port of Leith of the units of the various constituents of artificial manures or feeding stuffs in common use be prepared by the chemist periodically, and submitted to the Directors for approval and publication.

The Board unanimously approved of the recommendations, and remitted to the convener of the Chemical Committee to bring them before the general meeting in June.

ARGYLL NAVAL FUND.—In accordance with the recommendation by the Committee in charge of the Argyll Naval Fund, Mr Charles Hope Dundas, R.N., was added to the list of recipients.

MEETING OF DIRECTORS, 4TH JUNE 1879.

Present—The Hon. George Waldegrave Leslie; Sir George Douglas Clerk of Penicuik, Bart.; Sir John Marjoribanks of Lees, Bart.; Sir James R. Gibson Maitland of Clifton Hall, Bart.; Mr Graham Binny, W.S.; Mr Dickson of Corstorphine; Mr Dingwall, Ramornie; Mr Ferguson, Kinnochtry; Mr Gillon of Wallhouse; Mr Hendrie of Larbert; Mr Hope, Duddingston; Mr Irvine of Drum; Mr Kirkwood, Killermont; Mr Mackenzie of Portmore; Mr Mylne, Niddrie Mains; Mr Plummer of Sunderland Hall; Mr Ritchie of Middleton; Mr Ross, Bachilton; Mr Smith, Stevenson Mains; Mr Smith, Whittinghame; Mr Walker of Bowland, C.B.; Professor Wilson; and Dr Aitken.

Mr F. N. Menzies reported apologies for the absence of the Earl of Strathmore; Lord Polwarth; Sir Robert Menzies of Menzies, Bart.; Mr Copland, Mill of Ardlethen; Mr Kennedy of Sundaywell, Brandleys; Mr Murray of Dollerie; Mr Oswald of Dunnikier; and Mr Young of Cleish.

Before proceeding with the business on the programme, the following resolution was unanimously agreed to:—

The late Mr Seton Wightman of Courance.—That the Directors of the Highland and Agricultural Society of Scotland desire to express their deep and sincere regret at the loss which the Society has sustained by the death of Mr James Seton Wightman of Courance, convener of the county of Dumfries, one of their number, and their sense of the cordial assistance rendered by him as a Director of the Society.

The late Captain Tod of Howden.—A letter was read from Mr William Tod of Heatheryhaugh, returning his sincere thanks to the Directors for the expression of their sense of the services rendered to the Society by the late Captain Tod.

General Meeting.—The programme of business to be brought before the half-yearly meeting of the Society on the 18th was arranged, and the list of candidates for election was submitted.

Perth Show.—The Secretary stated that all entries of implements must be made on or before the 6th current, and that as Friday the 13th current was the last day for lodging certificates of stock, he would attend at the Royal George Hotel, Perth, on that day to receive entries and close the list.

Deputation to Exhibition in London.—The Secretary (Mr Menzies) was instructed to inform Mr Jenkins, the Secretary of the Royal Agricultural Society of England, that the Directors of the Highland and Agricultural Society of Scotland purpose sending a small deputation to London to visit specially the great agricultural exhibition at London at the end of this month.

New Zealand Stud-Book, &c.—A letter was submitted from Mr Robert Wilkin, 4 Langlands Place, Dumfries, sending at the request of the president of the Agricultural and Pastoral Association of Canterbury, a copy of the first volume of the New Zealand Draught Horse Stud-Book, being the first draught horse stud-book published in the colony.

A letter was also reported from Professor Lorimer, sending copies of his pamphlet on the Fixity of Tenure.

The Secretary stated that he had already, in name of the Directors, thanked Mr Wilkin and Professor Lorimer.

MEETING OF DIRECTORS, 18TH JUNE 1879.

Present—The Hon. George Waldegrave Leslie; Sir James R. Gibson Maitland, Bart.; Mr Copland, Mill of Ardlethen; Mr Dingwall, Ramornie; Mr Hog of Newliston; Mr Hope, Duddingston; Mr Irvine of Drum; Mr Kennedy of Sundaywell; Mr Kirkwood, Killermont; Mr Mackenzie of Portmore; Mr John Ord Mackenzie of Dolphinton; Mr Mylne, Niddrie Mains; Mr Plummer of Sunderland Hall; Mr Ralston, Glamis; Mr Smith, Whittinghame; Mr Smith, Stevenson Mains; Mr Campbell Swinton of Kimmerghame; Professor Wilson; Mr Young of Cleish Castle—Mr Copland in the chair.

Apologies were reported for the absence of the Marquis of Lothian; Professor Balfour; Mr Gillon of Wallhouse; Mr Hendrie of Larbert; and Mr Whyte Melville of Bennochy.

Deputation to London.—It was resolved that the deputation to London should visit Rothamstead and Woburn, and that Dr Aitken should accompany the gentlemen named at last meeting.

The remainder of the business referred more particularly to the various matters to be brought before the general meeting of this date.

MEETING OF DIRECTORS, 23D JULY 1879.

Present—Sir James R. Gibson Maitland, Bart.; Professor Balfour; Mr Graham Binny, W.S.; Mr Dickson of Corstorphine; Mr Dingwall, Ramornie; Mr Gillon of Wallhouse; Mr Hope, Duddingston; Mr Mackenzie of Portmore; Mr John Ord Mackenzie of Dolphinton; Mr Murray of Dollerie; Mr Mylne, Niddrie Mains; Mr Ritchie of Middleton; Mr Young of Cleish Castle; and Dr Aitken—Mr Mylne, Niddrie Mains, in the chair.

Mr F. N. MENZIES reported apologies for the absence of the Marquis of Lothian; the Hon. G. Waldegrave Leslie; Sir George Douglas Clerk of Penicuik, Bart.; Sir Alexander Muir Mackenzie of Delvine, Bart.; Admiral Maitland Dougall; Mr Irvine of Drum; Mr Kennedy of Sundaywell, Brandleys; Mr Kirkwood, Killermont; Mr Ralston, Glamis; and Mr Smith, Whittinghame.

THE LATE MR SETON WIGHTMAN. A letter was read from Mr John Seton Wightman of Courance, conveying to the Directors the sincere thanks of his mother and the the other members of the family, as well as his own, for the kind expression of their sense of the assistance rendered by the late Mr Wightman for many years in connection with the business of the Society.

GENERAL MEETING OF MEMBERS AT PERTH.—Various notices of motions to be brought before the general meeting of members to be held at Perth on Wednesday the 30th current were reported :—

HISTORY OF THE SOCIETY. Copies of the History of the Society, by Mr Alexander Ramsay, Banff, were laid on the table. Mr Menzies stated that he had read all the sheets as they were printed—that the History was thoroughly in accordance with the archives of the Society, and could be completely relied on as a genuine authority. Mr Ramsay had spared neither time nor trouble in the work, and he felt sure the members and the public would find the book both interesting and instructive.

MEETING OF DIRECTORS, 5TH NOVEMBER 1879.

Present—The Hon. George Waldegrave Leslie, Sir Michael R. Shaw Stewart of Blackhall, Bart.; Sir James R. Gibson Maitland of Clifton Hall, Bart.; Mr Dingwall, Ramornie; Admiral Maitland Dougall of Scotscraig, Mr Dundas of Arniston, Mr Ferguson, Kinnochtry; Mr Gillon of Wallhouse; Mr Hope, Duddingston; Mr Irvine of Drum; Mr Kirkwood, Killermont; Mr Mackenzie of Portmore; Mr Murray of Dollerie; Mr Mylne, Niddrie Mains; Mr Oswald of Dunnikier; Mr Ralston, Glamis; Mr Ritchie of Middleton; Mr Smith, Whittinghame; Professor Wilson; Mr Young of Cleish; Dr Aitken—Mr Ferguson, Kinnochtry, in the chair.

Mr F. N. MENZIES reported apologies for the absence of the Marquis of Lothian, K.T., President; Mr Dickson of Corstorphine; Mr Kennedy, Brandleys; Mr Whyte Melville of Bennochy; Mr Smith, Stevenson Mains; and Mr Walker of Bowland, C.B.

DUMFRIES SHOW, 1878.—The premiums awarded for mares in foal at the late show at Dumfries (payment of which had been suspended till birth of foals was certified) were reported to have been finally awarded, as follows :—1. Lawrence Drew, Merryton, Hamilton, for "Regina;" 2. Alexander Galbraith, Croy-Cunningham, Killearn, for "Topsy;" 3. David Buchanan, Garscadden Mains, New Kilpatrick, for "Maggie;" 4. No award, none of the other animals having produced foals in terms of the regulations.

PERTH SHOW, 1879, AWARDS.—The Board confirmed the awards at the late Show at Perth, and the Chairman was authorised to sign orders for the money premiums, which the Secretary was instructed to issue, along with the medals, as early as convenient.

TRANSFERENCE OF TICKETS.—The Secretary stated that the Show tickets of every kind were marked "not transferable," but that two members and two exhibitors had at the late Perth Show transferred their tickets, and had at once been detected. The directors resolved not to report the names, but that an example would be made in the event of similar cases occurring in future.

KELSO SHOW, 1880. It was remitted to the Committee on General Shows to suggest amount of prizes and adjust the regulations for the Show to be held at Kelso next year.

PROPOSED SHOW AT STIRLING IN 1881.—Requisitions for a Show to be held at Stirling in 1881 were reported, and it was remitted to the Committee on General Shows to prepare the classes for which premiums should be offered.

GENERAL SHOWS.—The minute of the Special Committee appointed to consider the rotation of the General Shows was submitted, from which it appeared that the Com-

mittee met on the 15th of October, and that by a majority it was resolved to recommend that the existing arrangements regarding districts be adhered to.

CHEMICAL ANALYSES.—The resolution at the general meeting held at Perth, "that the Society subsidise their chemist, so that he would be able to give the members analyses at the same rates as local associations do," was referred to the following committee:—Mr Mackenzie of Portmore, Convener; Professors Maclagan, Balfour, and Wilson; Messrs Melvin, Bonnington; Swinton, Holyn Bank; Hutchison of Carlowrie; Monteith, Tower Mains; Munro, Fairnington; Smith, Stevenson Mains; Ferguson, Kinnochtry; Cochrane, Waterside Lodge; Mylne, Niddrie Mains; Ritchie of Middleton; Smith, Whittinghame; Murray of Dollerie; Walker of Bowland, C.B.; Sir Graham Montgomery, Bart., M.P.; Messrs Hew Crichton, S.S.C.; Hog of Newliston; Graham Binny, W.S.; Stewart of Ingliston; George Auldjo Jamieson, C.A.; and T. G. Murray, W.S.; Mr Hope, the mover of the motion, to be called to the meeting.

REVISION OF CHARTER.—The resolution at the same meeting—"That a committee be appointed to revise the Society's charter and consider any changes which the altered state of matters now existing may render necessary"—was referred to the Law and Finance Committees, and Mr Mollison, Dochgarroch Lodge, the mover of the resolution.

ARGYLL NAVAL FUND.—On the recommendation of the committee in charge of the Argyll Naval Fund, of which Admiral Maitland Dougall of Scotscraig is chairman, the following naval cadets were nominated to the benefit of the fund, viz.:—Mr Edward W. Elphinstone Wemyss and Mr Edward Walrond de Wells Bruce.

EXPERIMENTAL STATIONS.—Dr Aitken reported that the crops on the experimental stations had been safely got in, but that owing to the lateness of the season, thrashing was not yet completed; so that he could give no definite details regarding the experiments for a few weeks. He believed, however, that the results of the barley crop would be found very satisfactory, and form an important contribution to the general investigation that was going on.

REPORT BY DEPUTATION TO LONDON.—The Secretary laid on the table a report by Dr Aitken on a visit to Rothamstead, and stated that a report on the Kilburn Show was in progress.

LECTURES ON FODDER AND FEEDING.—The Secretary intimated that Dr Aitken proposed to give a course of six lectures on the subject of "Fodder and the Laws of Nutrition," in the Society's Hall, No. 3 George IV. Bridge, on Wednesdays, at two o'clock, beginning Wednesday, 19th November. Members of the Society and their friends are invited to attend.

AGRICULTURAL EDUCATION.—The Secretary reported that the examination for the Society's bursaries took place on the 29th October, when 6 students passed for bursaries of £20 each and 2 for bursaries of £10 each.

MISCELLANEOUS REMITS.—The following remits were made:—To the Committee on Office-bearers, to report on vacancies and suggest list for 1880; to the Committee on Essays and Reports, to read and report on the papers lodged in 1879, and to revise the list for 1880; to the Committee on District Competitions and on Cottages and Gardens, to revise the awards for 1879, and consider the applications for 1880.

INTERNATIONAL DAIRY FAIR AT NEW YORK.—The Secretary stated that the Second International Dairy Fair, to be held at New York, commences on Monday, 8th December next, and continues for two weeks.

PRESENTATION OF BOOKS.—The following works presented to the Society's library were submitted:—Strangeway's "Veterinary Anatomy," second edition, revised and edited by I. Vaughan, F.L.S., &c., Lecturer on Anatomy and Zoology at the New Veterinary College, Edinburgh—presented by the publishers, Messrs Bell & Bradfute, Edinburgh; Volume II. of "The Ayrshire Herd Book," compiled by the Hon. G. R. Vernon—presented by the Ayrshire Herd Book Association; and a variety of publications from the Foreign Literary Exchange of Norway, presented through Mr Christian Holst, Norwegian Court Paymaster, Honorary Associate of the Highland Society. The Secretary added that he had already, in name of the Society, thanked the several donors.

MEETING OF DIRECTORS, 3D DECEMBER 1879.

Present—The Hon. George Waldegrave Leslie; Sir Michael R. Shaw Stewart of Blackhall, Bart.; Sir James R. Gibson Maitland of Clifton Hall, Bart.; Mr Dingwall, Ramornie; Mr Gillon of Wallhouse; Mr Ferguson, Kinnochtry; Mr Hope, Duddingston; Mr Irvine of Drum; Mr Kennedy of Sundaywell Brandleys; Mr Mackenzie of

Portmore; Mr Mylne, Niddrie Mains; Mr Plummer of Sunderland Hall; Mr Ross, Bachilton; Mr Smith, Stevenson Mains; Mr Smith, Whittinghame; Mr Wemyss of Bowland, C.B.; Major Wauchope of Niddrie Marischal, Professor Wilson, Dr Aitken Mr Fergusson, and afterwards Mr Gillon, in the chair.

Mr F. N. Menzies reported apologies for the absence of Mr Hendrie of Larbert; Mr Kirkwood, Killermont; Mr Murray of Dollerie; and Mr Ralston, Glamis.

Finance.—The Secretary submitted a statement of the funds at the close of the financial year, and reported that the books and vouchers had been placed in the hands of Messrs Mackenzie & Smith, C.A., the Society's auditors.

General Meeting.—The anniversary general meeting of the Society was fixed to be held on the 21st January 1880, being the third Wednesday of the month, and the usual day for holding the meeting.

Office-Bearers for 1880.—The report by the committee on office-bearers for 1880 was read, and the Secretary was instructed to communicate with the noblemen and gentlemen suggested to fill the vacancies which occur in January next, before publishing their names.

Report of Deputation to Kilburn Show.—Report of deputation appointed by the Directors of the Highland and Agricultural Society of Scotland to visit and report upon the Show of the Royal Agricultural Society of England, held at Kilburn, London, in July 1879:

"According to previous arrangement, the deputation met at the Royal Agricultural Society's Rooms, Hanover Square, London, on Monday, 30th June, and thereafter proceeded to the Show at Kilburn. They also visited the Show ground on Tuesday the 1st July, on Wednesday the 2d, and again on Saturday the 5th July. On Thursday, the 3d July, in conformity with their instructions, they went down to Rothamstead, Dr Lawes' experimental farm, and on Friday the 4th to Woburn, where the Duke of Bedford has provided ground to the Royal Agricultural Society for the purpose of carrying on experiments of a similar kind.

"*The Show.*—The deputation were much impressed with the general excellence of the exhibition. On the quality of the stock they think it is unnecessary to enlarge, as so much has been published on the subject; they may, however, state that they were glad to see that the Clydesdale horses attracted great attention, and still even in England maintain their pre-eminence as agricultural horses. Of implements and machinery there was perhaps the largest and finest collection ever got together at an agricultural show. It is unnecessary for the deputation to refer to the fearful state of the ground caused by the wet weather, but they feel bound to express their admiration of the zeal and energy of the management under the most trying circumstance. No doubt the Council of the Royal Agricultural Society could have small choice of a site in the immediate vicinity of London, and although it had been drained previous to the Show at great expense by the Society, being of the stiff composition of the London clays, the water could not readily find its way to the drains, and the spaces between the sheds were almost impassable, except where roads had been laid down with timber and other material at great expense. This shows the importance of carefully studying the nature of the ground where such large meetings are to be held, and that a dry open bottom should always be secured to provide against the unfortunate occurrence of bad weather.

"*Shedding and Refreshment-Rooms.*—The Secretary having arranged to meet the contractor of the Highland Society's showyards on the ground, various alterations and arrangements were gone into and agreed upon by them of a minor kind, which are unnecessary to mention in this report; but the deputation think that the plan of having a club-house and refreshment-rooms for the members alone is a good one, and might be adopted by the Highland Society; otherwise the refreshment-rooms and their management were certainly in no way superior to our own.

"*Stewards.*—The plan adopted by the Royal Agricultural Society of having stewards assisting in the management of the Show having been so often proposed to the Highland Society as an improvement, the deputation think it right to say that, however necessary they may be in a Show of such magnitude as that which they have visited, they do not see that they are required at the Shows of the Highland Society. The stewards at Kilburn were under the control of one head, Mr Jacob Wilson, who is most energetic, and well able for what he undertakes.* At the Highland Society's Shows, if appointed, they would require to be under the control of the Secretary; but as the Secretary does not ask such assistance, and has hitherto, with the working staff which assists him, managed the Shows in a most satisfactory manner, the deputation do not see that in the meantime any such change is called for.

"*General Meeting.*—The deputation attended the general meeting, which was held

* Since this Report was published it has been pointed out that Mr Wilson is responsible for his own department only, viz., the general arrangements in the showyard; and that he does not interfere with the stewards of stock, implements, finances, &c., nor do they interfere with him.

in the showyard, and conducted under the presidency of His Royal Highness the Prince of Wales. The business was confined entirely to votes of thanks to His Royal Highness and the various parties connected with the Show, and passed off in the most orderly manner.

"*Turnstiles.*—After paying particular attention to the mode of admitting the public by turnstiles, and after a careful observation of its advantages, and considering the experience furnished at the late Perth Show of the plan so long followed by the Highland Society, the deputation have come to the conclusion that they should recommend them to be adopted at the next Show.

"*Rothamstead and Woburn.*—The deputation visited Rothamstead on Thursday the 3d July, under the guidance of Mr Craik, son-in-law to Dr Lawes, who accompanied them from London, had a carriage in waiting for them at the Harpenden Station, and hospitably entertained them in the fine old mansion at Rothamstead. Dr Gilbert, who was also in attendance, went over the experimental plots and explained them. They found that very great care and accuracy are practised there, and, upon the whole, consider it a most important national institution. The general system of manuring, as carried out by our practical farmers in Scotland, is in the main in accordance with the results as proved by experiment at Rothamstead, and is probably to a large extent founded upon them. It is highly gratifying to know that Dr Lawes has made provision that this most useful institution should be permanently carried on by laying aside a large sum of money for the purpose.

"*Woburn.*—The deputation also visited Woburn. This station is under Dr Voelker's direction, and, being in its infancy, is not so interesting as Rothamstead, but after a few years elapse it must prove a valuable auxiliary in promoting this important branch of agricultural knowledge. As these experimental farms are to be the subject of a special report by Dr Aitken (which will be published in the forthcoming volume of the Society's 'Transactions'), it is unnecessary to enlarge further upon them here. The deputation do not think that they should omit to mention that they, together with the Marquis of Lothian, as President of the Highland and Agricultural Society, received a special invitation to Woburn Abbey from the Duke of Bedford, as President of the Royal Agricultural Society, of which invitation they were unfortunately prevented from availing themselves, owing to previous engagements.

"*Laboratory of the Royal Agricultural Society.*—The deputation visited the laboratory which the Society has erected behind their rooms in Hanover Square. It is very plain and simple in its construction, and well-adapted for the purpose intended. It is detached from the rooms, and cost about £1200. They think it would be very desirable that the Highland Society should possess such a laboratory of their own as soon as possible, and within a reasonable distance of their chambers.

"*Reception of Deputation.*—The deputation have the greatest pleasure in recording that the utmost courtesy was shown them by all the officials connected with the Royal Agricultural Society, and that they were entertained at dinner in the Langholm Hotel by the Council, along with the other deputations attending the Kilburn Show.

(Signed) THOS. MYLNE.
CHA. SMITH."

GENERAL SHOWS.—*Report by Special Committee.*—The report by the Special Committee appointed to consider the rotation of the General Shows was submitted, and the Secretary was instructed to get it printed, and send copies to the newspapers.

KELSO SHOW, 1880.—At the last meeting of the Board it was remitted to the Committee on General Shows to consider and arrange the premiums to be offered at Kelso next year. The committee met on the 12th November, and suggested—1st, That the premiums for cattle, horses, sheep, swine, and poultry should be the same as at Perth, except the premium for the stallion for agricultural purposes to serve in the district of the Show, which was restricted to £100; and the premiums for hunters, which were recommended to be increased, but to be left open till the Secretary ascertained at Kelso whether money or two silver cups, of the value of £20 each, were preferred. 2d, That the family prizes in the shorthorn breed should be £20, £10, and £5. 3d, That the family prizes for Border Leicesters should be £15, £10, and £5. 4th, That the Tweeddale Gold Medal should be given for the best Border Leicester tup in the yard. It was further suggested (1) that consideration of the arrangement of the implement department should be remitted to the Committee on Machinery after the premiums for reports have been decided; (2) that the date of the Show should be from the 27th to the 30th July, both inclusive, and that the last day for receiving entries should be—for implements, 4th June; stock, 11th June; (3) that the two silver cups given for the best stallion and for the best mare should be open to former winners. The report was adopted, and will be laid before a meeting of members to be held in the Cross Keys Hotel, Kelso, on Friday the 12th current, at one o'clock.

PROPOSED SHOW AT STIRLING IN 1881.—The committee recommended that the classes at Kelso should be repeated at Stirling, the ages being altered where necessary,

with the following additions and alterations:—1. That there should be family prizes in the Ayrshire in place of the Shorthorn breed, the family to consist of a cow of any age and three or more of her descendants, male or female. 2. That there should be three sections for bulls of the Highland breed as formerly. 3. That there should be family prizes in the Blackfaced in place of the Border Leicester breed, the family to consist of one aged tup, two ewes, two shearlings, and two lambs. The ewes to have lambs in season 1881, and all bred by exhibitor except the aged tup. 4. That the number of ewes, gimmers, wethers, and hoggs be exhibited in pens of three in place of five as heretofore. 5. That in place of premiums for wool, the offer should be for the best woolled tups of the Blackfaced, Cheviot, and Leicester breeds. The report was approved, and will be laid before a meeting of members to be held in the Golden Lion Hotel, Stirling, on Friday the 19th current, at one o'clock.

Transactions of the Society.—The report by the Special Committee on the mode of procuring papers for publication in the "Transactions" of the Society was submitted.

District Competitions, &c.—The reports by the Committees on District Shows and on Cottages, detailing the awards at the various competitions held during 1879, and suggesting the districts for 1880, were submitted and approved of. The following new rules were also adopted:—(1.) The premiums are open to general competition to all within the boundaries of the district of the local Society; (2.) The silver medals for bulls, tups, or boars are open only to first prize animals at former District or General Shows.

MEETING OF DIRECTORS, 7th JANUARY 1880.

Present—Marquis of Lothian, K.T., President; Hon. George Waldegrave Leslie; Sir James R. Gibson Maitland of Clifton Hall, Bart.; Mr Dickson of Corstorphine; Mr Dingwall, Ramornie; Mr Dundas of Arniston; Mr Gillon of Wallhouse; Mr Hope, Duddingston; Mr Kennedy of Sundaywell, Brandleys; Mr Mackenzie of Portmore; Mr John Ord Mackenzie of Dolphinton; Mr Mylne, Nisbet Mains; Mr Oswald of Dunnikier; Mr Ralston, Glamis House; Mr Smith, Stevenson Mains; Mr Smith, Whittinghame; Mr Walker of Bowland, C.B.; Professor Wilson; Dr Aitken—The Marquis of Lothian, and afterwards Mr Gillon of Wallhouse, in the chair.

Mr F. N. Menzies reported apologies for the absence of Lord Polwarth, Mr Graham Binny, W.S.; Mr Irvine of Drum; Mr Whyte Melville of Bennochy; Mr Murray of Dollerie; and Mr Ritchie of Middleton.

Office-Bearers.—The Secretary reported that the names of the noblemen and gentlemen to be proposed by the Directors at the general meeting on the 21st current to fill the vacancies in the list of office-bearers for 1880 had been published in terms of the bye-laws.

General Meeting.—The programme of business for the anniversary general meeting on the 21st was arranged.

New Members.—The list of candidates for admission as members was submitted, and the Secretary stated that additional names could be received up till the morning of the 21st.

Finance.—A state of the funds of the Society at 30th November 1879, and abstracts of the accounts for 1878–79, signed by Mr Walker of Bowland, C.B., Treasurer, and Mr Murray of Dollerie, Convener of the Finance Committee, and by Messrs Mackenzie and Smith, C.A., the Society's Auditors, were submitted, in terms of the bye-laws.

Chemical Department.—The resolution at the general meeting held at Perth—"That the Society subsidise their chemist, so that he would be able to give the members analyses at the same rates as local associations do"—was referred by the Directors to the Committee on the Chemical Department and on Finance, with the addition of Mr W. P. Hope, Leith, the mover of the resolution. The Committee held its first meeting on the 12th November. In the absence of Mr Hope they found it difficult to arrive at any definite issue, on account of the wording of the motion not being sufficiently explicit. They discussed at some length the advantages enjoyed by the members of local associations, and found that the financial basis of such associations was usually of such a kind that each member paid annually into a common fund a certain small sum per 100 acres of his farm. A certain part of that fund was set aside to pay for analyses. That the sum paid to a chemist was a matter for arrangement between the association and the chemist, but probably it differed very slightly if at all from that charged by the Society's chemist. As, however, many members did not send in samples for analysis, those who did were able to get one or more analyses performed without any further or special payment. There was no

limit set to the number of samples which any member might send in, but all were received so long as the fund held out. It was usual, however, to effect some economy in that matter when it was found that certain of the samples sent in had been sold under the same guarantee, in which cases one sample was selected as a type of the rest. By this arrangement it was evident that a member who farmed 400 acres and paid into the association's fund 10s. annually (being at the rate of 2s. 6d. per 100 acres) might receive for that sum one or more analyses. The committee reviewed the various resolutions passed by the Society concerning the duties of the chemist, as affecting the subject of the remit. In the absence of Mr Hope, it was thought expedient to adjourn the meeting after appointing a sub-committee, consisting of Mr Mackenzie of Portmore and Dr Aitken, to meet Mr Hope, and obtain definitely his interpretation of his motion.

Mr Mackenzie and Dr Aitken afterwards had an interview with Mr Hope, who stated his interpretation of the resolution, and what he recommended was as follows: —(1.) That the motion at Perth may be held actually to rescind the previous prohibition as to the appropriation of the Society's funds for the cheapening of analysis to members. (2.) The subsidising their chemist meant that the Society should pay a certain proportion of the price of analyses to members as charged by their chemist. (3.) That there should be a limit to the number of analyses which each member could have performed at that rate. (4.) That these reduced rates be only available to members who are farming land.

The committee held a second meeting on the 26th of November, when, after careful consideration, it was resolved to place the following proposals before the general meeting in January, not as emanating from themselves, but simply as what appears to them the most practical method of carrying into effect the resolution of the general meeting at Perth:- That the motion carried at the general meeting at Perth may be held as rescinding any understanding which previously existed, that no part of the Society's funds should be appropriated for the cheapening of analyses to members. That the most simple method of giving effect to the motion is to diminish the charges to members for analyses of manures or feeding stuffs by, say, one-half, the other half of the fee being made chargeable upon the Society's funds. That the amount of money so expended for any member shall not exceed 10s. annually. That the arrangement be made subject to there being sufficient funds at the disposal of the Directors for the purpose.

The committee held a third meeting on the 17th of December to consider a letter from Dr Aitken, which was remitted by the Board for the consideration of the committee. In his letter Dr Aitken called the attention of the Directors to the pressing need which existed for obtaining adequate accommodation and assistance, in order to enable him to carry on efficiently the greatly increased work in connection with the experimental crops at the Society's stations, and stating that the establishment of a specially constructed and properly equipped laboratory was the only arrangement that could give permanent satisfaction, but that in the meantime it was very desirable that some temporary arrangement should be made to provide for the investigation of the barley crop that has now been sampled. Dr Aitken added that he thought temporary accommodation might be obtained, but that it would take about £50 to make the necessary alteration and furnishings. The committee resolved to recommend the Directors to bear the expense of the necessary outlay.

The Directors approved of the proceedings of the Chemical and Finance Committees, and the report is now published to afford members of the Society an opportunity of considering the suggestions which have been made before the general meeting on the 21st current.

Hall and Chambers.—At the half-yearly general meeting on 18th June last, it was, on the motion of the Hon. Waldegrave Leslie, referred to the Hall and Chambers Committee to consider the number of eligible houses in Edinburgh now in the market, and to report upon any really suitable house or houses for the offices of this Society, where also the Society's chemist may be able to carry out analyses of manures, feeding stuffs, &c., for the benefit of members of the Society, in the same manner as is now so efficiently carried out by the Royal Agricultural Society of England. The following members were afterwards added to the committee:—Mr Melvin, Bonnington; Mr Mylne, Niddrie Mains; the Hon. George Waldegrave Leslie; and Mr Mackenzie of Portmore. The committee held two meetings—namely, on the 17th December and 6th January—when, after very careful inquiry, it was resolved to report that they had failed to find suitable premises in the Old Town, and that only three alternatives appeared to them—First, that the present hall be converted into a laboratory, and accommodation for the general meetings found outside; or, second, that rooms be rented in India Buildings for a laboratory; or, third, that the Directors be authorised to purchase any suitable premises that may come into the market, whether in the Old or New Town.

The Board approved of the report of the Hall and Chambers Committee, and agreed

to publish it, to afford members an opportunity of considering the suggestions before the general meeting, when the report will be disposed of.

REVISION OF CHARTER.—The resolution of the general meeting of members, held at Perth in July last—"That a committee be appointed to revise the Society's charter, and consider any changes which the altered state of matters now existing may render necessary"—was, at the Board meeting on 5th November, referred to the Committees on Finance and Law, with the addition of Mr Irvine of Drum, Sheriff of Argyll; and Mr Mollison, Dochgarroch Lodge, the mover of the resolution at Perth.

The committee met on 10th December, and having gone carefully over the charter, reported that, under the regulations made by the Society and recited in the charter, the fourth regulation bears that "the Society shall also annually at the said general meeting in January choose out of their ordinary members, who are usually resident in Edinburgh or its immediate vicinity, a Board of thirty Directors, of whom at least seven shall be newly elected; and also ten Extraordinary Directors, who may be only occasionally resident in Edinburgh."

Mr Mollison suggested that this regulation should be altered as follows:—"The Society shall also annually, at the said general meeting in January, choose out of the ordinary members a Board of thirty Directors, special regard being had to the convenience of one-third of that number for attending meetings of the Board held in Edinburgh—seven members at least shall be newly elected. The Society shall also at same meeting choose twenty Extraordinary Directors, seven of these to be newly elected, and not fewer than seven out of the whole number to be resident in the district in which the Show of the year is to be held." Mr Mollison expressed himself satisfied with the charter in every other respect; and the committee, conceiving that the Society has authority under the tenth regulation of the charter to make such bye-laws as would give full effect to Mr Mollison's suggestions, recommended them for the adoption of the Directors.

The Board approved of the various suggestions, except that the number of newly elected Extraordinary Directors should, as at present, remain at ten in place of seven.

The proposed new bye-laws, in conformity with the report and Directors' finding, were then read; and it was resolved to bring them up again at next Board meeting, previous to being submitted to the anniversary general meeting on the 21st current, in terms of the charter.

KELSO SHOW, 1880.—The report of the meeting of members held at Kelso on the 12th December was submitted, from which it appeared that a discussion took place on the proposed premium of £100 for the best stallion for agricultural purposes to serve in the district of the Show in season 1880; that it was moved by Mr Scott Dodgeon, Longnewton, and seconded by Mr Calder, Halterburn, that the meeting approve of the £100 as sufficient. Mr Haddon, Honeyburn, moved as an amendment, and Mr Roberton, Harperton, seconded, that the meeting recommend the Directors to increase the premium to £150. On a vote being taken the amendment was carried. It was agreed to recommend an increase of the prizes for hunting mares and geldings (sections 13 and 14) from £20, £10, and £5, to £30, £15, and £10 in both sections; also to increase the prizes for jumping horses from £10, £5, and £3, to £20, £10, and £6. Messrs Haddon, Honeyburn; Usher, Stodrig; and Roberton, Ladyrig, were appointed a committee to co-operate with the Directors in connection with the Spring Show of stallions. The report was approved.

IMPLEMENT DEPARTMENT.—It was resolved to extend the period for receiving reports on the best method of arranging the implement department to 23d of February.

GALLOWAY CATTLE.—A letter was submitted from the Rev. John Gillespie, Mouswald, secretary of the Galloway Cattle Society, stating that at a meeting of the council of that society, held at Dumfries on the day of the Union Show in August last, it was unanimously resolved to approve of the resolution brought before the general meeting of the Highland Society in the showyard at Perth by Mr Graham, Parcelstown, to the effect that the same rule should be applied to Galloways as to Shorthorns, in respect of their being eligible for entry at the Shows of the Highland Society. The letter was remitted to the General Show Committee.

PROPOSED SHOW AT STIRLING, 1881.—The Secretary reported that at a meeting of members held at Stirling on the 19th December, the list of the classes of stock was approved of, subject to the following additions and alterations suggested for the consideration of the Directors:—1. That there should be a section for three-year-old Ayrshire cows in milk. 2. That the section for tups three shear and upwards of the Blackfaced, Cheviot, and Border Leicester breeds should be deleted, and the section for two shear tups in these breeds be open to all tups above one shear. 3. That there should be a class for collie dogs, both long-haired and short-haired, male and female. The Board approved of the various suggestions made at the Stirling meeting.

MEETING OF DIRECTORS, 21st JANUARY 1880.

Present- The Marquis of Lothian, K.T., President; the Duke of Buccleuch, K.G.; the Hon. George Waldegrave Leslie; Sir James R. Gibson Maitland of Clifton Hall, Bart.; Mr Dickson of Corstorphine; Mr Dingwall, Ramornie; Admiral Maitland Dougall of Scotscraig; Mr Ferguson, Kinnochtry; Mr Gillon of Wallhouse; Mr Hope, Duddingstone; Mr Kennedy of Sundaywell, Brandleys; Mr Kirkwood, Killermont; Mr Mackenzie of Portmore; Mr John Ord Mackenzie of Dolphinton; Mr Murray of Dollerie; Mr Mylne, Niddrie Mains; Mr Oswald of Dunnikier; Mr Ralston, Glamis; Mr Ritchie of Middleton; Mr Turnbull Smith, C.A.; Mr Smith, Stevenson Mains; Mr Smith, Whittinghame; Mr Campbell Swinton of Kimmerghame; Mr Walker of Bowland, C.B.; Professor Wilson; Mr Young of Cleish Castle; Dr Aitken.

Mr F. N. Menzies reported apologies for the absence of Sir Michael R. Shaw Stewart of Blackhall, Bart.; Mr Hendrie of Larbert; Mr Maxwell Inglis of Loganbank; and Mr Irvine of Drum.

The business had reference principally to the subjects to be brought before the general meeting of this date.

PROCEEDINGS AT THE GENERAL MEETINGS.

GENERAL MEETING, 14th JUNE 1879.

Mr COPLAND, Mill of Ardlethen, Senior Ordinary Director present, occupied the Chair.

Mr MENZIES, Secretary, stated that he had received a letter from the Marquis of Lothian, the President of the Society, who was to have taken the chair, regretting that it was impossible for him to be present, as the General Commanding the District had intimated that he would commence the inspection of his regiment of Militia that day.

NEW MEMBERS.—[illegible] new members were elected.

PERTH SHOW, 1879.—Mr Menzies, in the absence of Mr Gillon of Wallhouse, said—I have, in the first place, to report that the competition for the premium of £150 for the best draught stallion to serve in the district of the Show, took place at Perth on the 14th of February, when 38 horses were entered, and that the premium was awarded to Mr David Riddell, Blackhall, Paisley, for his stallion "Luck's All." I have, in the next place, to report that the arrangements for the meeting at Perth, which will be held from the 29th of July to the 1st of August inclusive, are progressing as satisfactorily as could be desired. The entries closed on the 13th inst., and the following is a statement of the head of stock, &c., compared with the last show at Perth in 1871 :—

	Perth, 1879.	Perth, 1871.
Cattle	383	376
Horses	[illegible]	177
Sheep	470	684
Swine	[illegible]	[illegible]
Poultry	200	301
Wool	[illegible]	[illegible]
Dairy Produce	49	88
Implements	2207	1948

The district connected with the show comprises the Eastern Division of Perthshire, Western Division of Forfarshire, Fifeshire, and Kinross-shire. The following gentlemen have been named to act on the General Committee of Management :—*Eastern Division of Perthshire.*—Viscount Stormont, Robert Clark, Taybank; Lieutenant-Colonel Williamson of Lawers, John Drummond of Blackruthven, John Richmond, Dron; John Robertson, Old Blair; Charles T. C. Grant of Kilgraston, James Small of Dirnanean, James Leslie, the Thorn; William Crawford, Balgarvie. *Western Division of Forfarshire.*—E. A. Stuart Gray of Gray, Colonel Ogilvy, yr. of Inverquharity; Robert M'Gavin of Ballumbie, Patrick Webster of Westfield, William Arnot, Mains of Glamis; Alexander Bell, Kirkton of Tealing; William Whyte, Hatton of Eassie; John Alexander, Ballindarg. *Fifeshire.*—The Earl of Elgin and Kincardine, Colonel John Balcarres of Balbirnie, Alexander [illegible] of Hill, Admiral Maitland Dougall of Scotscraig, Colonel J. Anstruther Thomson of Charleton, David Bell, Todhall; John Ballingall, Dunbog; John Bell, Stenton; James Beveridge, Crombie; Robert Mitchell, Cadham. *Kinross-shire.*—James Marshall of Duncrevie, William Tod, Gospetry; Thomas M. Tod of West Brackly. *City of Perth.*—James Dewar, Dean of Guild; Bailie John M'Arthur, Bailie James Wotherspoon, Bailie F. P. Carnegie, Bailie John Chalmers, Daniel M'Kenzie, City Treasurer; Councillors Andrew Martin and David Galloway, Alexander Hay, live stock salesman; and John M. Fraser, live-stock salesman. There will also be a large and influential deputation of the Directors and other Office-bearers, headed by the Marquis of Lothian, President of the Society. A meeting of the General Committee was held at Perth on Friday the 13th inst.—Sir Alexander Muir Mackenzie of Delvine, Bart., chairman of the local committee, presiding—when the following sub-committees and attending members were appointed :—

COMMITTEES.—Admission of Stock—Mr C. T. C. Grant of Kilgraston, convener; Mr John M'Dougall, Goodlyburn; and Mr George Kyd, cattle-salesman. Admission of the Public—Sir Alexander Muir Mackenzie, convener; Bailie Wotherspoon, Chalmers,

[illegible]

and Carnegie; Councillors Martin and Galloway; Mr A. Burns Macdonald, commissioner for Lord Kinnaird; Mr E. Dangerfield, factor to the Earl of Mansfield; Mr R. C. L. Blair, Perth; Mr Hay, Victoria Auction Mart; Mr Fraser, Perth Auction Market. Banquet Committee—Marquis of Lothian, Duke of Athole, Lord Provost Richardson (convener), Mr Stuart Gray of Gray and Kinfauns, Viscount Stormont, Colonel Williamson of Lawers, Sir Alexander Muir Mackenzie, and Bailie M'Arthur. Ball Committee—Lord Provost Richardson, convener; Bailie Carnegie, Viscount Stormont, Mr James Small of Dirnanean, Colonel Anstruther Thomson, Sir Alexander Muir Mackenzie, Sir Thomas Moncreiffe, Mr Alexander Bethune of Blebo, Dean of Guild Dewar, and Mr John Richmond, Dron. Forage Yard—Mr John Drummond of Blackruthven, Mr Thomas Ross, Bachilton; Mr David Dow, Balmanno. Accommodation of Strangers—Lord Provost and Magistrates, and members of Town Committee. Police Committee—The Lord Provost and Sir Alexander Muir Mackenzie, chairman of the County Police Board.

The different contracts have been for some time completed. The showyard is being erected by Mr Matthew Richardson, Annan, on the western division of the South Inch, which has, as on former occasions, been kindly granted for the purpose by the Lord Provost and Magistrates of the city of Perth. The refreshments in the yard will be purveyed by Mr Robert Wilson, confectioner, Perth; Messrs Aitchison & Sons and Mitchell; Mr A M. Thiem, Windsor Hotel, and Mr John Warner, Edinburgh. The contract for the supply of forage in the yard is in the hands of Mr W. S. Ferguson, Friarton, Perth. The headquarters of the Society will, as formerly, be at the Royal George Hotel. The judging of the stock will commence on Tuesday, 29th July, at eleven o'clock, when the yard will be opened to the public. In accordance with a desire strongly urged on the General Show Committee by a deputation from the Scottish Agricultural Engineers' Association, at a meeting held on the 19th February, no money prizes or medals will be given for implements of any kind, and no inspection of them by the judges will take place. The general meeting of the society will be held in the yard on Wednesday, 30th July, at 1.30. On the evening of that day the President's dinner will take place; and on the following evening the usual ball will be held. Tickets have been sent to all members residing in the district connected with the show. Members residing in other localities will be supplied on application to the Secretary. Further details will be contained in the programme, which will in due course be advertised.

The report was approved of.

Kelso Show, 1880.—Mr Menzies further reported that the arrangements for the Kelso Show, 1880, were just in the same position as they generally were at this time, and he need not trouble the meeting by going into details.

The Society's Offices.—The Hon. George Waldegrave Leslie moved—"That it be referred to the Hall and Chambers Committee to consider the number of eligible houses in Edinburgh now in the market, and to report upon any really suitable house or houses for the offices of this Society, where also the Society's chemist may be able to carry out analyses of manures, feeding stuffs, &c., for the benefit of members of the Society, in the same manner as is now so efficiently carried out by the Royal Agricultural Society of England." In speaking to the motion the hon. gentleman stated that he would alter it with the permission of the meeting, so that it should read that the committee have power to purchase or feu. He did not bring the proposal forward on behalf of the Directors. He had their permission to do so, but they would not be committed by anything he had to say. The last time this was brought forward he was one of those who opposed it, as he thought the time chosen for taking action in the matter was inopportune. Now he thought the time was very opportune indeed. Owing, unfortunately, to the depressed condition of trade, of manufactures, agriculture, and other industries, as was too well known to the public, there was now a vast amount of house property in the market in Edinburgh, and, considering that there were now very little short of 5000 members in the Society as compared with 4400 when this motion was first brought before them, he thought the premises, with their long staircase, were scarcely suitable for overtaking all that he was sure every one in the room would like to see done by the Society. The premises as a whole were very limited. The Board-room was not very large, and its windows were filled with obscured glass. There was not room enough for the chemist carrying on any practical analysis in the laboratory in such a way as was desirable for the future welfare of the farming interest of this country. The Royal Agricultural Society of England had attached to their premises in Hanover Square a large and capacious laboratory, where they maintained Dr Voelcker and a large staff of assistants; and the farmers, he was glad to say, had to a great extent availed themselves of that accommodation, and benefited by it. There was nobody who doubted that part of the distress prevailing at this time in connection with the agricultural interest was owing to the want of proper analyses of agricultural manures. They heard of a commission of £1 per ton being given for some of the manures hawked about in the market. If that were the case—if what

were called manures could be sold at a price which would yield a commission of £1 per ton—he thought it high time that these were thoroughly investigated without fear by this great Society, backed as it was by its large amount of capital. The Royal Society of England was not at all afraid of undertaking these analyses, and in many cases of publishing the results. He (Mr Waldegrave Leslie) was not at all afraid of any legal action being taken in consequence of what the Society might do in that way. As to the change of site of their offices, he reminded the Society that the Union Bank, after being founded for a century, he thought, in Parliament Square, had found it necessary to remove to George Street. He was not himself, either directly or indirectly, concerned in any property in Edinburgh, so that he had no premises whatever to bring forward or erection to recommend. He only asked the meeting to consider whether this was not a good opportunity for investing part of their spare capital—for making an investment which would not only be good in itself but good for the Society and for agriculture, by having large suitable premises, which now, unhappily for many people, could be got at a very reasonable rate. It was very desirable to concentrate the business of the Society as far as possible into one spot, and he thought the advantages to be derived from that would be such that the proposal would commend itself to those opposed to removal, even although the Hall and Chambers Committee should recommend some other part of Edinburgh than that in which they were gathered. He understood there were no rooms in the neighbourhood which could be made suitable for the object in view. Without taking up further time, he (Mr Waldegrave Leslie) would conclude by submitting his motion.

Lord Denman said that to the motion as it originally stood he could not have the smallest objection, because the Hall and Chambers Committee, in considering and reporting to a general meeting of the Society, would enlighten all the members on the subject, and not bind the Society to anything. But to give the committee power all at once, without having a notice on the paper that that was intended, was too much to expect the meeting to join in. He had no hesitation in seconding the motion if it was confined to what was before them in print.

Mr Melvin, Bonnington, said that the remarks of Mr Waldegrave Leslie were satisfactory so far, but it seemed to him somewhat disrespectful to the members of the Society to bring the motion forward at what was more a formal meeting in connection with the arrangements for the show than a meeting for the disposal of important business. Three years ago last January the same subject was brought forward by the directors, and submitted to the meeting held on that occasion, and after full discussion by one of the largest meetings ever assembled within that room, it was decided by a majority of twenty to one to remain where they were, and not to go to George Street or the New Town. He should have thought that before such a proposal was brought forward again it should have been better announced, and also brought forward at the corresponding meeting in January. For these reasons he meant to propose the previous question. He did not object to providing suitable accommodation or sufficient accommodation for whatever was required by the directors for practical work by the chemist. For many years he had supported the plan of having a suitable laboratory, with suitable accommodation for the chemist, as one of the most important objects this Society could propose. He, however, held that the New Town of Edinburgh was not the place for establishing a laboratory. They had Professor Crum Brown at the University, and Dr Falconer King also close at hand, as well as Dr Stevenson Macadam. To go away from their present place to the New Town was therefore, he held, a mistake. More than that, he had to state that he recollected of being present at one of the general meetings which was held in the old hall at Albyn Place. On that occasion there were several noblemen, several landed proprietors, and a good many merchants present, but no tenant-farmers so far as he could see. The directors found that that was not as it ought to be. If it was to be a national society, it should be supported by the tenantry as well as the landed proprietors. They found it necessary to remove to the place in which they were now met; and what was the result? In place of a membership of under 2000, they had nearly 5000. Why? Simply because they carried the farmers along with them. To adopt the proposal now submitted without further consideration was therefore, he held, unfair to all those members who, as it were, ought to have their views taken on the subject. There was no doubt the Society was one for the farmers' good, and he thought there should be a much larger proportion of farmers on the direction of the society. If that were the case, he thought more good would be done to the farmer. There were respectable men among the writers to the signet and bank directors, but it was practical men they wanted there, and until they had practical men on the directorate it was not possible to have the good done to the country that the Society was capable of. As they secured where they were the attendance of the tenantry, was the objection not likely to be urged against them if they removed to the New Town—he submitted that they were in danger of it by adopting Mr Waldegrave Leslie's proposal—that they were going away back to the New Town to get quit of the farmers as a body!

The Hon. G. WALDEGRAVE LESLIE.—I would be sorry to see that.

Mr MELVIN said he had just put that view because it was worthy of the consideration of the meeting whether anything should be done at the present time, chiefly to encourage the idea that that was the sole panacea for alleviating distress which the Society could urge upon the members. He begged to move the previous question.

Mr M'CULLOCH, Denbie Mains, seconded the amendment.

Mr SMITH, Whittinghame, said that for himself personally he thought it would be desirable to have the premises removed to the New Town. No doubt many who attended the meetings attended the market in the first instance; but practically it just came to this—What time did it take to go from there to the New Town? because it was almost universally the case that gentlemen went to the New Town. The clubs were also there. Then those who had to travel by railway had to go to the New Town to get away home, so that it was simply a matter of time. If it took ten minutes or a quarter of an hour to go to new premises in the New Town, the way to arrange the matter would be to postpone the meeting for a quarter of an hour, which would enable them, if it were necessary, to stay longer at the market. They must also be all aware of the justness of the complaint of having to go up such a long flight of stairs to the hall. A friend of his had remarked that it was discreditable for a society like that to take old gentlemen up such a long stair and put them in the top loft. It was necessary, at all events, that there should be a change in the circumstances, and if it was admitted that it was an uncomfortable place in which to hold a meeting, and that it was necessary to develop that important department of the Society, chemistry, how could that be done except by outlay? He questioned very much whether it would not cost more to alter the premises than to buy new ones—taking into account what they would get for the present building. He thought it would be well, at least, to give the matter full consideration; and if it did appear that it would lead to such expense as would be unreasonable, then it would be time enough to pass it aside. He did not consider that the proposal had been brought forward in any unbecoming way at all. If it were thought that this were not a proper meeting at which to dispose of the subject, then it could be adjourned till next meeting; and notice of the motion could now be given.

Dr CRAIG asked if the motion now before them was the one as originally printed, or as Mr Waldegrave Leslie wished to amend it?

The Hon. GEORGE WALDEGRAVE LESLIE said he stood by the motion as printed.

Dr CRAIG then said that the motion did not commit them to go to the New Town or to any particular spot in Edinburgh. They could go if they thought proper to Chambers Street, which was near the University, and also near the laboratories of Dr Falconer King and Dr Stevenson Macadam. Then there were vacant stances in Castle Terrace and many other places besides the New Town. He considered that this was a proper meeting to bring forward the motion as printed, because if the motion were carried to-day the committee would report to the January meeting. The report could be made known to the members beforehand, so that they would have an opportunity of discussing the matter in all its bearings at a full meeting. On the other hand, if the subject were postponed till January, then the discussion would be left over till the small meeting in summer. He did not see why they should not be perfectly unanimous in appointing a committee.

Mr JOHN ORD MACKENZIE of Dolphinton said that the last time this matter was brought before the society there was a large January meeting. The matter was late in coming up; and it was left to him, as convener of the committee, to move the adoption of the report, which was seconded by Mr Murray, and carried without remark. The fullest powers were then given to the Hall and Chambers Committee to sell the present premises and purchase others; but so far as he recollected, as time went on there was a general feeling among the directors that, although the motion was passed *sub silentio*, there was an undercurrent of opposition to it, and the directors took no immediate steps in the matter. It afterwards came more openly before the directors, and a motion was carried, nobody contradicting it, that no further action be taken. The matter had lain until the motion of Mr Waldegrave Leslie now brought it up, and he wished the Society would in some way or other speak with no uncertain sound, that they should give distinct instructions, and not come to one decision at one time and another at another. He felt strongly that they should only proceed on a unanimous vote of the members, and that the opinion of even a small minority wishing to retain the premises where they were, and not desiring new offices, ought to be given effect to.

On a division, 45 voted for Mr Waldegrave Leslie's motion, and 32 for the amendment.

Sir JAMES GIBSON MAITLAND said he thought it would be well to put on the committee some of those who used the markets. Mr Menzies must know that having the office close to the market must be an advantage to the Society. He accordingly

moved that two tenant-farmers be added to the [illegible], Mr Wyllie, Nether Mains, and Mr Melvin, Bonnington.

The name of the Hon. George Waldegrave Leslie was also added to the committee.

Mr MELVIN said he could only act on the committee on the understanding that the premises were not to be shifted from this neighbourhood.

Sir JAMES GARDINER BAIRD said that they could not put any gentleman on the committee who made a special condition.

CHEMICAL DEPARTMENT.—Mr MACKENZIE of Portmore said that Dr Aitken's lectures had been attended with much interest by between fifty and eighty, and he had to intimate that they would be continued in future on days more suitable for tenant-farmers. He then said—As convener of the committee in charge of the chemical department, I have to report that the remit from the last general meeting to the directors, to consider how members of the Society can be put in possession of the advantages at present given through local associations with a greater guarantee of correctness, was, at the meeting of the Board in February, referred to the Chemical Committee. That committee held a meeting on the 26th of February, when the Secretary read a letter from Mr W. P. Hope, Leith, the mover of the motion at the general meeting, in which he stated that he believed the time had now arrived when the Society would confer a great boon upon its members by providing them with cheap and accurate analyses and reports upon manures and feeding stuffs, as also upon the various soils; and he suggested that this be done by the Society's chemist, the farmers paying the same rate into a fund towards his remuneration as they at present pay to the analytical associations with which they are connected, and that the chemist should be instructed to give valuations when asked for, in accordance with the general price lists of the day, but not otherwise. Mr Hope also suggested that a form drawn up from the various price lists be continually in the hands of the chemist, who could send the same to the farmers as the basis of valuation when required to make the same. The committee reported that, being limited by the resolutions of former general meetings in regard to the expense of analyses, they saw no way of furthering the object proposed by Mr Hope in that direction; but they thought it worthy of the consideration of the Board whether the chemist should not be authorised to make analyses at rates to be arranged sufficient to pay him; and that, on his finding manures or feeding stuffs, sold with a guarantee, not coinciding therewith within a certain limit, the name of the seller or manufacturer should be published, if deemed expedient, after the analysis has been submitted to him for explanation as to the discrepancy. The board on the 5th March unanimously approved of the suggestion, and remitted back to the committee to make arrangements for carrying it out. The committee accordingly held a meeting on the 12th March, and resolved to recommend that the directors should authorise Dr Aitken to act as analytical chemist to the Society, as well as chemist in charge of the agricultural stations. Dr Aitken produced to the committee a leaflet containing the scale of charges now made by him, and which he informed the committee was the same as charged by other first-class analytical chemists in Scotland. The committee, having duly considered the scale of charges, recommended that it be approved of by the directors. A copy of it accompanied their report, and copies may be had either at the Society's chambers or direct from Dr Aitken, Chemical Laboratory, Clyde Street, Edinburgh. The committee also recommended that in all cases where a member of the Society has submitted to the chemist of the Society a sample of manure or feeding stuff, along with the written guarantee under which he purchased it, and upon analysis the said manure or feeding stuff is found not to coincide with the written guarantee, within certain limits to be hereafter determined, the chemist shall forward the analysis to the seller for explanation, and shall report the case, along with the written guarantee, his analysis, and the explanation of the seller (if any), to the directors for disposal. The committee further suggested that publicity should be given to the proposed action, if adopted, and that, where necessary, the name of the defaulter should be published in the newspaper report of the directors' meeting. The directors, on the 2d of April, remitted back to the committee to frame a plan of procedure, and report to next meeting. The committee again met on the 23d April, and having carefully considered the whole subject, resolved to recommend—1st, That a table of simple but clear instructions for selecting and sending samples of artificial manures and feeding stuffs for analysis be prepared for the use of members of the Society. 2d, That this table be submitted to the next general meeting of the Society, and authority requested to the following course of action, viz.:—That when any member of the Society shall have purchased artificial manure or feeding stuffs under a written guarantee, and shall have submitted to the Society's analytical chemist a sample of such artificial manure or feeding stuffs, taken in accordance with the Society's instructions above referred to; and when upon analysis the Society's chemist shall discover that serious discrepancy exists between the actual constituents of the articles so analysed and the supposed constituents as taken from the guarantee under

which the article was purchased, he (the chemist) shall report such discrepancy in full detail to the Chemical Committee, and along with his report shall forward the invoice, guarantee, and any other documents he may have received in connection with the case, and any correspondence which may have passed between him and the vendor on the subject ; that thereupon the Chemical Committee shall consider the whole circumstances of the case ; and if it appears to them that in the interests of the Society and of agriculture generally the facts of the case and the name of the vendor should be published, they shall prepare a report and submit it to the Society's law agents for their opinion, and shall then submit their report along with the opinion of the Society's law agents to the directors of the Society, who shall be empowered to deal with the matter in such way they shall deem best. 3d, That a table of the current values at the port of Leith of the units of the various constituents of artificial manures and feeding stuffs in common use be prepared by the chemist periodically, and submitted to the directors for approval and publication. The board on the 7th May unanimously approved of the recommendations, and remitted to the convener of the Chemical Committee to bring them before this general meeting.

Mr Hope, Leith, said he thought that the members of the Society were much obliged to the committee for the prompt manner in which they had acted in connection with the matters referred to in the report, which were very important, considering the way in which they had been dealing in artificial manures and feeding stuffs. He hoped that they would go a little further—which would be a help in these hard times for agriculture—and subsidise their chemist, so that he would be able to give them analyses at the same rate as the local associations did. He was sure they could not spend their money in a better way at the present time. It was only those who were acquainted with the trade who knew the amount of money lost by the farmers on account of their ignorance as to what they were dealing in. He hoped that the committee would take that matter into consideration, and, if possible, adopt the suggestion.

Mr Mackenzie said that they were not able to take up the question of subsidising the chemist, because they were not authorised to have analyses made at rates less than those of other chemists.

Mr Hope said he wished to give notice of a motion to the effect of what he had suggested.

Lord Denman said that he had lost two animals from bad feeding, and it would be a good thing if steps were taken so that people would know not to employ vendors of bad articles, and also where good feeding stuffs could be purchased.

The report was adopted.

The Society's Experimental Stations.—Dr Aitken, chemist to the Society, in reporting on the above, said—I take the earliest opportunity to lay before you a few statistics of the first year's cropping on the agricultural experimental stations of the Society. At the date of last general meeting the crops had been more than a month under snow, and for two months thereafter they were in the same condition. Occasional thaws exposed them now and then, and put them in great danger ; but on the whole they were well protected by the winter's snow. Considering the widespread injury done to the turnip crop from the extreme severity and long duration of the frost during the past winter, it is satisfactory to be able to report that the crop of Swedes at Harelaw was got in in fair condition, although that operation was not completed till the beginning of April. At Pumpherston, where the crop was yellow turnips, an attempt was made to get it in during a temporary thaw in January, but half was not lifted when a sharp frost set in, which put a stop to all field work. The part of the crop left in the ground suffered so much injury thereafter, that, although it was able to be taken off the ground, it was scarcely fit for use as fodder, and almost useless for experimental purposes. In the remarks which follow I shall therefore confine myself to the crop of Swedes on the Harelaw station, leaving the results at Pumpherston, which are somewhat irregular, and not altogether trustworthy, to be read in conjunction with the report of the crop which is at present in the ground. The statistics, so far as they have yet been arrived at, regarding the experiments at Harelaw, confirm in most particulars the anticipations which I ventured to make in my last report. The advantage is in favour of the dissolved manures in every instance, and this advantage amounts to 24 cwt. per acre on the average, or, in other words, about 12 per cent. more turnips were produced by the dissolved than by the undissolved phosphates. The results enable us to see which kind of phosphatic manure has acted most rapidly on the crop. In this respect phosphatic guano and ground apatite take the lead in both series, and it is remarkable how exactly their results agree. These two substances, when dissolved, have produced the heaviest crop on the whole station—that is to say, "superphosphate," made from these materials, with the addition of the uniform amount of nitrogenous and potassic manures. Bone dust is slower in its action than the other phosphatic manures, and in the undissolved state has produced only 5 cwt. per acre more than plot 11, which had

no phosphates. Having seen that the dissolved phosphates have produced the largest crop, the question naturally arises, What is the increase due to? Is it to a general increase of all the constituents of the turnip, or to the special increase of one or more of these constituents? This is a very extensive inquiry, involving labour; and its reliability depends upon the care and accuracy with which it is carried out. I need not here enter into any detail regarding the methods employed, but will simply refer to the mode of sampling, upon the trustworthiness of which the value of everything else depends. I selected from each plot forty turnips, representing, as nearly as the eye could judge, an average growth of turnips on that plot. The smaller crops grown with undissolved manures contained, on an average, 1⅛ cwt. total solids per acre in excess of the larger crops grown with dissolved manures; that is to say, an increase of almost 3½ per cent. in the total solids. To conclude from this, however, that the effect of applying phosphates in a soluble form was to decrease the total amount of solids in the crop of turnips, would be to draw a hasty and perhaps erroneous conclusion, for the ground coprolite plots give an opposite indication, and averages drawn from opposing data are apt to be fallacious. It seems highly probable, however, that dissolved manures tend to increase the amount of water in the crop. It is shown that turnips grown with dissolved phosphates abstract from the soil a greater amount of mineral matter than the others, to the extent in this case of nearly forty pounds per acre, which is about 17½ per cent. Whether this excess is due to a uniform increase of all the ash constituents of the turnip, or to some special constituents, I have not yet determined; so that I am not yet able to say whether the excess of mineral matter adds much to the feeding and manurial value the turnips grown with dissolved manures. The constituent in a turnip which is of most importance in enhancing its feeding value is the albumenoid matter. It exists in turnips in very small quantity, and it is mainly owing to their deficiency in this constituent that turnips alone are not a fattening diet, and that cattle, when being fed chiefly on turnips, require to have added to their fodder some highly albuminous substance, such as oilcake, in order to keep them in good condition. It is found in the above crops that where soluble phosphates were applied the percentage of albumenoid matter is less, and that there is an actual diminution of albumenoid matter per acre to the extent of fully 10 per cent. A different season and a different soil may possibly have a very different tale to tell. Whether that be so or not, we have simply to put on record that one of the results of the first year's cropping on Harelaw station is to indicate that the use of dissolved phosphatic manures, while it has the effect of increasing the weight of the crop, does so mainly by increasing the water contained in the bulbs, and that it does so to the detriment of the feeding qualities of the turnip; and that, on the other hand, the use of undissolved phosphates, which seems to produce a smaller crop, really produces a crop which is larger, as containing more solid matter and albumenoid matter per acre, and which, moreover, is less severe upon the land. It remains for future experiments to test the truth of these conclusions. I may just refer shortly to the miniature plots at Harelaw. The results obtained on these, so far as they are reliable, confirm in some particulars those of the larger plots. Unfortunately the miniature plots suffered a good deal during the long winter. When the snow had cleared away it was found that a colony of rats, driven by scarcity of food, had settled down on two of these plots, and having made them pretty bare, extended their depredations, and visited with great impartiality the plots on both sides of their headquarters. The pigeons also seemed to take a special interest in the small plots. They appear to have made very frequent visits, and the discrimination with which they selected the best bulbs showed them to be fair judges of turnip. On one plot there was scarcely one good bulb from which they had not taken a sample.

Agricultural Education. Professor Wilson said—I have to report that the examination of candidates for the diploma and certificates in agriculture took place on the 31st March and 1st and 2d April, and that the following passed: *For Diploma*—John Malcolm Aitken, Crieff; John Craig, Innergeldie, Comrie; James Cannan, Urioch, Castle-Douglas; Arthur E. Brooke Hunt, (B.A., Trinity College, Cambridge), Peers Court, Dursley, Gloucestershire; John Wilson, jun., Fairfield, Lorton, Cockermouth. *For First-Class Certificate*—Michael Falcon, Stamburn, Workington; Lawford D. Glover, Findon, Worthing. *For Second-Class Certificate*—James M'Laggan, Coblehengh, Dinnet, Aberdeenshire; Robert M. Malloch, Balhaldie, Braco, Perthshire; Robert Menzies Traill, Orkney. The two prizes of £6 and £4 given by the Society to the class of agriculture in the Edinburgh University were this year awarded by special examination to—1st, William Martin, Dumfriesshire; 2d, W. J. N. Liddall, Edinburgh. Mr Liddall afterwards resigned in favour of Robert Menzies Traill, Kirkwall; and R. M. Malloch, Braco, Perthshire. I have further the pleasure of reporting that the Lords of the Committee of Council on Education have been pleased to allow holders of the diploma of the Society to earn payments on the results of their instruction in the principles of agriculture under the Science and Art Department without

undergoing the usual examination. It is, however, necessary for persons holding the diploma to make application to the Department before commencing teaching, in accordance with section 35 of the Science Directory.

Veterinary Department.—Mr Mylne, Nisbrie Mains, in the absence of Mr Gillon of Wallhouse, said—I have to report that the annual examination for the Society's veterinary certificate took place on the 7th and 8th April, when six students presented themselves for the final examination, and the whole passed. The preliminary examination of younger students was held at the same time, when 21 entered their names, and 14 passed.

Transactions.—Mr Irvine of Drum laid on the table vol. xi. (fourth series of the Transactions).

A vote of thanks to the chairman terminated the proceedings.

GENERAL MEETING AT PERTH, 30TH JULY 1879.

In accordance with a resolution passed at the annual general meeting of the Society held in Edinburgh in the month of January last, a general meeting of members was held in the Committee Room in the showyard at half-past one o'clock. There was a large attendance, from 250 to 300 being present; and the Most Noble the Marquis of Lothian, K.T., president of the society, occupied the chair.

Supporting Schemes for Increased Production.—The first motion on the programme was one by Mr Chalmers, Shielhill, which ran as follows:—"That any scheme which is likely to lead the way towards getting increased productions by improved systems of farming, combined with the feeding of stocks, and general farm management, ought to be encouraged and liberally supported by the funds of the Highland Society." Mr Chalmers, however, was unable to be present through the death of a relative, and the motion therefore fell to the ground.

Chemical Department.—Mr Hope, Leith, moved—"That the Society subsidise their chemist, so that he should be able to give members analyses at the same rates as local associations do." There were one or two points which he would like to speak to. The first was, that if it was true, and he supposed there were few but would admit, that farmers at the present day were spending at least one rent, if not nearly two, upon the purchase of fertilising and feeding stuffs, it appeared to him that this association, in such times of depression and trial for farmers could not expend their funds in a more legitimate way, and one more likely to be acceptable to farmers and landlords in general, as in subsidising their chemist, so as to enable him to make analyses in a systematic, correct, and uniform way, which would not cost the members of the Society more than half what was at present paid to other local societies. The loss incurred annually by farmers in farming upon what might be called the rule of thumb system was too well known to render it necessary that he should speak to it, and he would only refer to the experiments which had been lately begun in England and Scotland. Though many of them were yet very young, they had told them in a very startling way that farmers, while buying good manures and good feeding stuffs, might all the time be losing their money by misapplication of manures to soils without their knowing which manures to apply and which to uphold. He did not limit this motion merely to what farmers bought, but thought it might be prospectively applied to what they sold as well. Every farmer knew the difference between the value of a ton of hay well grown and properly manured, and a ton of hay ill grown and improperly manured. They had all heard of American adulteration of flour with plaster of Paris and bone meal and every other abomination; and he thought the farmers on this side of the Atlantic would do well to consider whether it would not be worth their while to see the real value of their produce as compared with American. In the matter of cheese and butter a great deal might be got out of a movement of this kind. There was another difficulty which the farmers had to contend with—namely, the understanding of analyses as they were presented to them at the present time. There were scarcely two chemists who made an analysis on the same principle, and as few who stated them in the same way; and he did not wonder that farmers should ignore the utility of analyses. He confessed it puzzled him to understand analyses, although he had them in his hands every day or two, especially when he got them from two different chemists. He believed this movement would have the effect of bringing chemists to see the necessity of making their analyses upon a uniform system, and in stating them in the same way. Another effect would be that they would have more confidence imported into the use of analyses. It was of very great moment that they should have analyses not only understood, but looked to as the main guide to the farmers' operations. He believed the effects of the present depression would be very materially lessened if farmers in the future trusted much more to a scientific management of their farms, and less to a rule of thumb system. They were fortunate in having a chemist connected with this association who was a man perfectly

enthusiastic in his profession, and who bid very fair to get farmers in what he would call the possession of a sort of Advocates' Library, which they could turn to at will. He did not think it would be out of place to say one word on behalf of the trade that he represented here. It had been too much held before farmers that manure manufacturers and feeding-stuff manufacturers had opposite interests from those of farmers. Nothing of the kind was true. He believed that the manure trade was substantially conducted in Scotland upon most economical terms. There was no other manufacture conducted on the same capital upon which there was less real profit, and they would hail with delight any universal system which would put them above suspicion.

Mr J. R. GLENDINNING, Hatton Mains, seconded the motion. He thought it only right to mention that, while he could testify to the fairness which they had experienced in their somewhat extensive purchase of artificial manures and feeding-stuffs from standard manufacturers, they had found it far otherwise this year in cases of several of the tenants upon the estates with which they were connected, and that the state of matters called loudly for reform. From six purchases made by these tenants, only one, on analysis, proved value for the price at which it was sold; and the other five showed deficiencies varying from 30 to 50 per cent. He thought that was sufficient to convince any one that what he would term the mid dle and smaller buyers were greatly in need of the Society's protection and guidance. He had great hopes that the Society taking up the position aimed at in the motion would greatly increase its usefulness.

Mr SMITH, Stevenson Mains, said—that whilst he agreed with the motion which had just been proposed by Mr Hope and seconded by Mr Glendinning, he thought a great deal might be said on the use to be made of these analyses. They were still in their infancy as a Society in regard to these matters. By the appointment of a chemist they had entered on an entirely new field, and very much of his time would be taken up in connection with the experimental stations. He was just afraid, therefore, that if they were to make use of their chemist for analysing to such an extent as this motion might lead to, it would have a prejudicial effect in the carrying out of what they were most anxious to see—namely, the results of their experimental stations. He suggested that the matter referred to in the motion be remitted to the directors for consideration, and to take such steps as they thought best.

Mr IRVINE of Drum seconded the amendment of Mr Smith. It was not antagonistic to the motion of Mr Hope, but only proposed that it be remitted to the directors for their consideration. He could only say for them, during the long time they had taken up the subject of agricultural chemistry, as noticed in the recently published history of the Society, and more at length in their blue-books, that whatever might be said of the directors, they had not at least failed in this, in giving due and ready attention to any suggestions made to them by the world outside.

The noble CHAIRMAN said as to the amendment, that there was a great deal to be urged in its favour; but while he most fully concurred in all that fell from Mr Hope on the subject, he had his doubts whether, according to the terms of the motion he had given, all that he wished to bring about by it would be secured. There were other questions which would crop up if the Society were to subsidise their chemist with the view of enabling him to give analyses to the members at a cheaper rate than otherwise could be given. He did not say that that was a thing that ought not to be done, but personally he thought the meeting would be well advised to accept Mr Smith's amendment. He felt quite sure, as the directors fully concurred in all Mr Hope had said, that the directors would do their best to give efficacy to the views which he had expressed.

Mr HOPE said his motion practically met the suggestion of the chairman, as it did not say that the chemist was to be subsidised except at the pleasure of the directors. If the motion was passed as submitted, it still went back to the directors to arrange details as to how it was to be carried out.

Mr SMITH, Whittinghame Mains, thought that if they adopted the motion the directors could not do otherwise than subsidise the chemist. They did not know but that the chemist might be remunerated enough without being subsidised, and he would not like to be committed to their doing that until the matter had received due consideration.

The Marquis of HUNTLY, who occupied a seat at the opposite end of the room from the chair, said that at that end of the room they did not know what was going on.

The noble CHAIRMAN accounted for that by the fact that when gentlemen took part in a public meeting they generally addressed the chair. The amendment, as he understood it, was that, while the directors concurred in the object of the motion brought forward by Mr Hope, they thought it would be better to remit the question for consideration by them previous to giving any decision on the point. After the word "subsidise" he suggested that Mr Hope should insert "or otherwise." It was desirable that they should have a unanimous decision.

Mr Hope said that he was sorry to appear a little tenacious on the point, but his motion was to secure that the chemist of the Society should analyse for its members at a low rate, as was done by other associations. He had not the slightest objection to the directors so subsidising and using that subsidy as they thought fit, if they chose to use it in such a way as the farmers could get the benefit.

Mr Dudgeon, Longnewton, said he had been long connected with an agricultural society such as that referred to by Mr Hope. He had no sympathy with the directors, as he thought they conducted the Society in rather a hole-and-corner manner. But he thought it would be very unfair that the Society should adopt a hasty motion of this kind, making it compulsory, in a measure, on the directors to adopt a certain course. It might take the wind altogether out of the sails of the local associations. He thought these were doing an incalculable benefit to the agriculture of Scotland at present; and it would be important if this matter were referred to the directors or some other committee to draw up a defined motion, rather than that they should carry one of this sort in a hasty kind of way.

The noble Chairman—As there is a good deal of difference of opinion on the subject, the only way to decide it is to put the question before the meeting and divide upon the motions.

The motion of Mr Hope was carried by a majority of hands being held up in its favour, although as many as ninety-six voted for the amendment of Mr Smith.

Encouragement to Implement Makers.—Mr Christie, Scotscraig Mains, next rose to propose the following motion, of which he had given notice:—"That a committee be appointed to fix what encouragement should be given to inventors, makers, and improvers of agricultural implements by their admission to the Society's shows free of charge, at greatly reduced charges, or otherwise." Since coming to the yard that day Mr Christie said he had been rejoiced to find that others were interesting themselves in what he had in view—the encouragement to be given to agricultural implement makers; but as a motion was to be proposed by Mr Greig that virtually covered his motion, he withdrew it.

Motions by the Hon. George Waldegrave Leslie.—The following motions given notice of by the Hon. George Waldegrave Leslie were respectively proposed and withdrawn:—(1.) "That it is desirable at future shows of the Highland Society to dispense with the exhibition of poultry, &c., and to make arrangements with the Edinburgh Christmas Club Show for the exhibition of poultry, &c., at their annual shows in December, when the poultry are in full feather, &c., &c." (2.) "That the deputation who went to the Royal Agricultural Society's Show at Kilburn be requested to draw up a report, containing any suggestions which they may think proper to make regarding the management of the Highland Society's Showyard, &c."

The Society's Charter.—Mr Mollison, Dochgarroch Lodge, Inverness, moved—"That a committee be appointed to revise the Society's charter, and consider any changes which the altered state of matters now existing may render expedient." He was not going to say that changes were needed in the charter, but, seeing that a very large number of the members of the Society had an idea that the charter was too restricted, and admitted of alterations, to promote the Society's usefulness, he had thought fit to bring the motion forward.

Colonel Williamson of Lawers said he had been requested to second the motion, and he had much pleasure in doing so. He believed that their charter was perhaps too restricted, and might prevent them doing all the good they might do as a society to this country of ours—Scotland. He by no means seconded the motion with any adverse feeling towards the directors of the Society. He believed that they did their duty well and with a feeling of uprightness, and wishing to work for the good of all. They might make mistakes, and if in the charter mistakes existed, there was all the greater excuse for any failings of the directors on that account. He expressed the hope that the directors would go along with any committee that might be appointed to investigate and probe to the bottom the features, the power, and the weakness, of their charter.

The Marquis of Huntly said that as he believed he was one of the first members of this Society who, six years ago, suggested that the charter should be altered, he would like to say a few words on this point. At that meeting, which was held in Edinburgh, he brought forward a series of resolutions before the directors, and urged them very strongly to carry out certain improvements. Every one of the improvements which was denied him then had since been carried out. One of them was, that they should have an anniversary meeting on the occasion of the show. This was the first time that the last of these proposals of his had been given effect to. It was answered to him then, and answered, he believed, very rightly, that the charter of the Society prevented the doing of things which were thought for the good of the country. He was of the same opinion as he held then—that it was certainly expedient to alter the charter of the Society, and he supported the proposal now made for the appointment of a committee. He would only say to the directors of the Society that there was no feeling of

animosity throughout Scotland towards them. There was this feeling—that they might certainly be quickened into more active life by the infusion of a little new blood. There were many points which friends of the Society could bring before them, but in that "Black Hole of Calcutta" (the room being crowded) the present was not the time for delaying the meeting nor the time for bringing up great questions. He did not wish to bully the directors, but there were certain points they might inquire into, and if they did so, they would have the support of the members of the Society.

The noble CHAIRMAN said that as he thought this a question which concerned the Society as a whole, he might say a few words on the subject. He thought Mr Mollison, in submitting the motion, scarcely quite appreciated the difficulty, if not the danger, of making any alterations on the charter. His object in making the motion was to give the Society greater powers; but the charter, if he would look upon it at this present moment, conferred great powers on the Society, and his (the noble Chairman's) only fear was, that if the charter was once meddled with at all, it might possibly end in the powers of the Society being further restricted rather than further enlarged. He was only stating his own opinion. Perhaps there were others who had read the charter, and had greater acquaintance with it than he had. At the same time, it must be admitted that great power existed in it for the Society making new regulations under the name of bye-laws, and it is just possible that these might be restricted if they were to seek an alteration in their charter. He was far from saying that it was not possible for the charter of the Society to be improved. It had been said that the directors made mistakes, as all human beings were apt to do, and that these were aggravated by the faults of the charter; but they must recollect that the charter, as it already existed, if it had mistakes, would be subjected to human review, and be liable to other and perhaps worse mistakes. He did not say that that would be so, but they must look to that possibility in altering the charter of a great society like theirs. He saw no difficulty whatever to the meeting accepting the motion if the mover consented to insert after "changes" the words "if any." If an efficient committee were appointed, he thought the Society might safely leave it to that committee—if they had confidence in the committee they recommended to be appointed—to say whether there should be any changes—whether they were expedient or not. He thought Lord Huntly was to be congratulated on seeing all his children growing up so nicely, although they were rather knocked on the head at the birth. They proved to the Society that the directors, to whom these things were so often left, were not adverse to any changes because they were changes, but they were anxious to give them due consideration; and the fact of their not seeing their way always to give effect to them when brought forward did not prejudice them afterwards in bringing them forward, if they found they were for the good and advantage of the Society.

Mr MOLLISON scarcely saw that the meaning of his motion was altered by what was now suggested, but to satisfy a large number of members on the point as to whether there were restrictions or not, he thought members would go with him in voting for a revisal of the charter.

Mr MARTIN, younger of Auchindenman, did not think time need be spent discussing the question as to the problematical idea of changes being required. By the charter the board of directors was to consist of thirty members, residing in Edinburgh and vicinity, and that had not been adhered to. That was a thing in reference to which they were breaking the charter. When locomotion was difficult it was necessary to have directors near Edinburgh to secure a quorum. But, going with the times, the Society had appointed directors throughout the country generally. The existence, however, of that regulation showed the necessity for alteration.

The noble CHAIRMAN said he understood that the motion did not necessarily carry any change, and he was quite willing to accept it as it stood, with the explanation given by Mr Mollison. When he spoke of seeking changes in a charter as not being desirable, he meant to imply that difficulties might arise in getting a new one to meet the exigencies of the Society, and in connection with their powers of making bye-laws, which might be taken away from them.

Mr M'LEAN, Carnwath House, moved "that the secretary be instructed to send a copy of the charter to all the members of the Society."

Several gentlemen seconded the motion.

The CHAIRMAN—That motion, not having been given notice of, cannot be properly carried; but there will be no difficulty, on the directors considering the matter, to let any member get a copy of the charter.

Mr BLUES, Dalruscan, asked who appointed the committee?

The CHAIRMAN, amid some laughter, read a bye-law giving that power to the directors, and added, as he saw that it met with some disapproval, that that bye-law was passed by the Society.

The Marquis of HUNTLY—Cannot a general meeting, announced by advertisement, alter a bye-law?

The noble CHAIRMAN—All such matters must be given notice of at one of the general meetings in January or June, and submitted to future meetings.

Mr MOLLISON then said he was quite willing to leave the matter in the hands of the directors. His experience of them had been such as to enable him to say that great liberality had been shown by them in these matters.

The motion was thereupon agreed to.

The Marquis of HUNTLY said that some of the members of the committee ought to be appointed from the outside, and not entirely from the directorate. If that were approved of, it would meet with the approval of all present.

The CHAIRMAN said it was not the practice of the directors to appoint only directors, and therefore others than directors would be placed on this committee.

MEETINGS OF MEMBERS AT THE SUMMER SHOWS.—The CHAIRMAN read the following motion, notice of which had been given by Mr G. W. Murray, Banff:—"That this meeting resolves that a general meeting of members shall be held at Kelso during the Show 1880, and remits to the directors to make the necessary arrangements for carrying out this resolution. Also resolves that a general meeting of members shall be held each year at the time and place of the Society's annual meeting." He (the Chairman) did not know what this motion meant, as it was identical with the one carried at last general meeting, which provided that a meeting should be held annually at the time and place of the summer shows, and of course there would be a meeting at Kelso in 1880.

Mr MURRAY expressed his pleasure that such a resolution had been adopted. He had been appointed to make this motion, and those who had been associated with him understood that only one annual meeting had been fixed upon. If the directors looked round the room they would see the popularity of such a meeting. He had lately had occasion to meet with the directors, and he always found them ready and willing to conciliate matters. He thought that the members had only to come in contact with the directors in order to see that they were willing and anxious to do right, and if the directors came in contact with the members at such meetings, and showed their hands, he did not think there would be any opposition to them.

The subject then dropped.

AWARDS BY THE MACHINERY COMMITTEE.—Mr GEORGE GREIG, Harvieston, moved—"That with the view to give greater confidence to exhibitors and purchasers of implements exhibited at the shows of the Society, the following gentlemen, all practically experienced in machinery and implements, be added to the Machinery Committee of the Society:—Mr John Kemp, Stirling; Mr J. A. R. Main, Clydesdale Iron Works, Glasgow; Mr John Marshall, Maybole; Mr John Young, Ayr; Mr William Wallace, Glasgow; and Mr Anderson, of Messrs Ben. Reid & Co., Aberdeen. In supporting the motion, he said it was right to explain that it did not emanate from him as an individual. He was put forward by the Society of Agricultural Engineers in Scotland. Many of the members present were aware that considerable dissatisfaction existed among the exhibitors of implements at this Society's show. Hitherto there had been a system of awarding medals without any practical test, and while this did not meet the views of implement makers, it also was a great evil in recommending implements untested to the members of the Society. The Agricultural Engineers of Scotland had resolved that, unless the Society tested all implements equally before awarding medals, they would not exhibit. A good deal of correspondence had taken place between the Society of Agricultural Engineers and the directors, and the result had been, he thought, an approach to an amicable arrangement. From what the chairman had said in regard to a previous motion as to the appointment of a committee, he was afraid his own motion would fall to the ground. He was very much pleased to find that the directors were prepared to meet them as to appointing practical men upon the committee. The Agricultural Engineers of Scotland were prepared to reduce the number of gentlemen proposed.

Mr MYLNE, Niddrie Mains, said—it appeared to him that Mr Greig had proposed rather too many names to be added to the committee. They did not like large committees, as they were not workable. The names of members of committees had always been selected by the directors, and he hoped Mr Greig would allow them still to do so. He was sure the directors would meet the view of the exhibitors. He thought it would be much better that this matter should be remitted back to the directors, on the understanding that they might add a few more names connected with the profession to the committee if they felt it to be desirable.

The CHAIRMAN said it had been already agreed that the engineers should be represented on the committee. He thought they would all be of opinion that it was very desirable that the exhibitors of agricultural implements should be generally satisfied with the treatment they received in the showyard, to incite them to send as many implements as possible. At the present time of depressed trade, when there was a cry

for increased production at less cost, nothing could continue more to the benefit of agriculture in general, and to the Highland Society as representing the agriculture of Scotland, than a sufficient show of agricultural implements. Therefore, if there was any way in which the directors could meet the views of Mr Greig, they were most willing to do so. The directors thought that perhaps the addition of seven or eight names, all of implement makers or manufacturers, would perhaps make the committee rather large; but having understood from Mr Greig that the society which he represented would be quite willing to accept three or four members, the directors proposed to meet him or a deputation from the society next morning to consult as to the adding of three or four implement makers to the committee.

GALLOWAY AND ANGUS HERD-BOOKS.—Mr GRAHAM, Parcelstown, moved—"That the rule 18, regarding Shorthorns, be also applied to Galloways, also to Angus or Aberdeen, if breeders of Angus or Aberdeen cattle wish it." He proposed that Galloway cattle eligible for competition should be entered in the Galloway herd-book. There was an animal exhibited at this show which it was difficult for any person to say what breed it belonged to. Even at the Royal Show at Kilburn there was a three-year old heifer which had eight broad teeth, which in ordinary circumstances meant five years old. Now, if animals entered in the herd-book were only eligible for exhibition, there would be much less liability to deception either as to age or otherwise.

The CHAIRMAN said—perhaps the only objection to the motion was that it was rather premature, as the herd-book was rather new. It might be a hardship to some who could show animals not entered in the herd-book. The motion might be postponed for a little while in order to allow exhibitors to enter, and then a sufficiently strong representation should be made to show that it was the general wish of the exhibitors.

Mr GRAHAM said the herd-book was not new, and that it had existed for sixteen years.

The subject then dropped.

JUDGING RINGS.—The CHAIRMAN read the following motion, given notice of by Lord Arthur Cecil:—"That, in the opinion of this meeting, proper and substantial judging rings should be provided for the various classes, both of horses and cattle; and that the directors are requested to arrange that at future shows such rings are substituted for the ropes hitherto used."

Lord ARTHUR CECIL said—that as the hint given in his motion had been substantially adopted at this show, he took the liberty of withdrawing his motion.

REPORTS OF COMMITTEES.—The programme having been gone through, a cordial vote of thanks was awarded to the chairman for presiding, on the motion of Lord POLWARTH.

As the meeting was separating,

Mr J. M. MARTIN, yr. of Auchendennan, rose and asked that he might be kindly allowed to put a question. It would be in the memory of many present that two committees were appointed at the January meeting—one upon circuit shows, and the other upon the Transactions of the Society. His motion was that a committee should be appointed to report to the meeting in June, but he was told that six months was too short, and that it would be necessary to adjourn the report to the meeting in January. So far as he was aware, that committee had not met to the present day. They did him the honour to make him a member of that committee, but he had not been asked to attend a meeting. The other committee was in the same condition.

The CHAIRMAN said that the chairman of the committee had left the room, and he was not in a position to answer the question.

The meeting then separated.

GENERAL MEETING, 21st JANUARY 1880.

MOST NOBLE THE MARQUIS OF LOTHIAN, K.T., President, in the chair.

NEW MEMBERS.—Sixty-four new members were balloted for and elected.

NEW OFFICE-BEARERS.—The following noblemen and gentlemen were elected to fill the vacancies in the list of office-bearers:—*Vice-Presidents*—Earl of Haddington, Earl of Wemyss and March, Lord Napier and Ettrick, K.T., Lord Reay. *Ordinary Directors*—Lord Arthur Cecil, Orchard Mains; Sir Hew Dalrymple of North Berwick, Bart.; James Cunningham, Tarbreoch; John Scott Dudgeon, Longnewton; John Forman, Dunerahill; R. H. Harris, Earnhill; William Eliott Lockhart of Borthwickbrae; David R. Williamson of Lawers. *Extraordinary Directors*—Lord Elcho, M.P.; Hon. Henry Constable Maxwell-Stuart of Traquair; Sir Robert Hay of Haystoune, Bart.; Sir William Scott of Ancrum, Bart.; Sir George H. Scott Douglas of Springwood Park, Bart., M.P.; Sir Dudley Coutts Marjoribanks of Guisachan, Bart., M.P.; David Milne Home of Milne-Graden, Colin J. Mackenzie of Portmore, James Smith, Chief Magistrate of Kelso; Archibald Campbell Swinton of Kimmerghame.

Mr Ballingall, Dunbog, said he did not mean to propose any amendment, but he wished to make a few remarks on the principle, or at all events the practice followed in the selection of the members of the directorate. So far as he could see in reading the lists of previous years, there were somewhere about twenty of the directors who were proprietors, ten or thereabouts might be tenant-farmers; and as to the extraordinary directors, they were entirely from the proprietors. He thought that if the election of the directors of the Society was kept in harmony with the spirit of the times, there should be a larger infusion of the tenant-farmer class in the directorate in the future. He wished to make these remarks in order that the directors might consider the subject in proposing lists in future years.

The noble Chairman said that this question would come up later on, in the report of the Committee on the Revision of the Charter.

The list of office-bearers was then agreed to.

Accounts for 1878-79.—Mr Walker of Bowland, C.B., submitted the accounts for 1878-79, which were approved.

Argyll Naval Fund.—Admiral Maitland Dougall presented the accounts of the Argyll Naval Fund for 1878-79, which were approved.

Perth Show.—Mr Gillon of Wallhouse, said—After the full reports of the late show at Perth, which have already been published, it is unnecessary for me to occupy the time of the meeting with more than a very brief statement of the results. The accounts are before you; and although they exhibit a probable deficiency of upwards of £300, still I am glad to say that in other respects the favourable anticipations entertained of the meeting were fully realised. The stock generally was of a superior character, and the implements, as well as the articles exhibited in the other classes, were highly satisfactory. The Society was fortunate in having had the presence and active supervision of the Marquis of Lothian, the President; while in Sir Alexander Muir Mackenzie it had the advantage of a most zealous chairman of the Local Committee. The Lord Provost and Magistrates afforded every facility; and the Commissioners of Supply for the counties embraced in the district of the show contributed, as you will observe from the accounts, to the auxiliary fund. I have, therefore, to move—"1. That the thanks of the Society be given to the Most Noble the Marquis of Lothian, K.T., President of the Society, for his attendance at the General Show at Perth, and for presiding at the general meeting held in the showyard, and at the public dinner in the County Rooms. 2. That the thanks of the Society be given to the Commissioners of Supply for the counties of Perth, Forfar, Fife, and Kinross, for the liberality with which the auxiliary fund was provided. 3. That the thanks of the Society be given to the Lord Provost and Magistrates of Perth for the cordiality with which they afforded their assistance in the arrangements connected with the Perth Show, and particularly for the use of the South Inch. 4. That the thanks of the Society be given to Sir Alexander Muir Mackenzie of Delvine, Bart., convener of the Local Committee elected by the counties of Perth, Forfar, Fife, and Kinross, for his personal exertions, and to the individual members of that committee for their co-operation in carrying into effect the wishes of the Society and the purposes of the Perth meeting.

The motion was unanimously adopted.

Kelso Show, 1880.—Mr Gillon of Wallhouse then said—I have, on the part of the directors, to report on the arrangements for the Show at Kelso, which it is proposed to be held on the 27th, 28th, 29th, and 30th July. The premium list has been arranged with the concurrence of the members in the district. The family prizes in the Shorthorn breed have been fixed at £20, £10, and £5; and in the Border Leicesters at £15, £10, and £5. The prizes for hunting mares and geldings have been increased from £20, £10, and £5 to £30, £15, and £10; and those for jumping horses from £15, £8, and £4 to £20, £10, and £6. The Tweeddale gold medal is on this occasion to be given for the best Border Leicester tup in the yard. These are all the changes in the stock prizes I need report on. In regard to the implement department, the meeting is aware that, acting in concert with the representatives of the Scottish Engineers' Association, three premiums of £20, £10, and £5 have been offered for approved reports on the best method of arranging that section of the show. The period for lodging reports was lately extended to the 23d of February. When received, the reports will be circulated among the members of the Implement Committee, and after being read, a meeting will be held to devise a plan for the future, which, after being considered by the directors, will be submitted to a full meeting of the implement makers at the Kelso Show, and thus they will have a voice in the new system before being finally adopted. The arrangements made for the exhibition of implements last year at Perth will therefore be repeated at Kelso. The showyard will, as on the three former occasions of the show being at Kelso, be within the grounds of Springwood Park. Messrs Haddon, Honeyburn; Usher, Stodrig; and Roberton, Ladyrig, have been appointed to co-operate with the directors in connection with the Spring Show of stallions. The premium has been fixed at £150.

PROPOSED SHOW AT STIRLING IN 1881.—Mr Gillon of Wallhouse said—I have now to lay before you a requisition transmitted to the directors since the last general meeting, and subscribed by a number of gentlemen extensively connected with the counties of Stirling, Dumbarton, and Clackmannan and western division of Perthshire, soliciting the General Show for 1881 to be held at Stirling. The directors, feeling that an application emanating from such a famed agricultural district had a strong claim to the favourable consideration of the Society, remitted to the General Show Committee to prepare a list of the classes of stock. The list was afterwards submitted to an influential meeting of members held at Stirling, when certain suggestions were made, all of which have since been given effect to by the Board. The list, as finally adjusted, I now submit; and being satisfied that the members generally will hail with pleasure the prospect of a renewed visit to the centre of a district of such historical interest, beg to move the following resolution:—"The meeting having heard the proposal to hold the General Show of live stock and implements at Stirling in 1881, for the district comprehending the counties of Stirling, Dumbarton, and Clackmannan and western division of Perthshire, approve of the same, and remit to the directors, with full power to carry out the necessary arrangements."

The motion was unanimously adopted.

THE CIRCUIT OF THE SOCIETY'S SHOWS.—Mr GILLON then submitted the following report which was held as read, in consequence of having been previously published in full:—

REPORT by SPECIAL COMMITTEE appointed to consider the Circuit of the Society's General Shows.

I. *Proceedings at, and Resolution by, General Meeting.*

At the Anniversary General Meeting of the Society, held on the 15th of January 1879, after Mr Gillon of Wallhouse had given in the Report on the proposed Show at Kelso in 1880, Mr MARTIN, Yr. of Auchendennan, in accordance with previous notice, moved: "That a Committee of Members be appointed to consider the whole question of the Circuit of the Society's Annual Shows, and to report to the General Meeting in June; also, that pending receipt of this report, the Society should delay until the June Meeting decision as to the place at which the Show of 1880 is to be held."

The motion having been duly seconded by Mr HENDRIE of Larbert,

Lord POLWARTH moved the previous question, which was seconded by Lord LOVAT.

The Rev. JOHN GILLESPIE, Mouswald Manse, proposed as a third motion, that the latter part of Mr Martin's motion be omitted, but that the first clause in it be agreed to, with the altered proviso that the report be submitted in January 1880, in place of June 1879.

After the Duke of Buccleuch had stated that he considered that Kelso and Inverness were both places which should be visited, the Secretary read two memorials that had been received from Inverness praying the Directors to continue the existing circuit. Thereafter Mr Martin agreed to accept Mr Gillespie's motion in place of his own as it originally stood. Lord Polwarth then stated that he had no objection to inquiry as to whether or not the number of places visited should be increased, provided none be omitted, and expressed his willingness to accept the motion as thus altered, and it was unanimously adopted as follows: "That the Show be held at Kelso in 1880, that a Committee composed of Directors and other Members be appointed to consider the question of the Circuit of the Annual Shows in future, and that a report be presented to the meeting of the Society in January 1880."

The Marquis of LOTHIAN, who, as President of the Society, occupied the chair, in declaring this finding, said he was quite sure the meeting generally was not in favour of striking off Inverness and Kelso. His own opinion was that if possible other places might be included in the circuit, and if any district which thought it had a right to be visited were to send in a requisition to the Directors on the subject, he had no doubt it would be duly considered. In reply to Mr Ord of Over Whitton, the Chairman intimated that the Committee resolved upon would fall to be appointed by the Directors.

II. *Appointment of the Committee.*

The Directors on the 5th of February remitted to the Standing Committee on General Shows to suggest names to act on the Special Committee. The Standing Committee accordingly met on the 19th of February and suggested the following names, being two members and a director from each of the eight districts:—

1. *Edinburgh District*—Messrs Dundas of Arniston; Gibson, Woolmet; and Mylne, Niddrie Mains.
2. *Dumfries District*—Sir Alexander Jardine of Applegarth, Bart.; Messrs Cunningham, Tarbreoch; and Seton Wightman of Courance *(since deceased)*.
3. *Perth District*—Messrs Williamson of Lawers; Reid, Cruivie; and Ralston Glamis House.

4. *Kelso District*—Messrs Campbell-Swinton of Kimmerghame; Munro, Fairnington; and Lord Polwarth.
5. *Stirling District*—Lord Dunmore, Messrs Murray, Catter House; and Hendrie of Larbert.
6. *Inverness District*—Sir Kenneth Mackenzie of Gairloch, Bart.; Messrs Mollison, Dochgarroch Lodge; and Smith, Whittinghame.
7. *Glasgow District*—Messrs Howatson of Dornel; Martin, Yr. of Auchendennan; and Sir Michael Shaw-Stewart of Blackhall, Bart.
8. *Aberdeen District*—Sir William Forbes of Craigievar, Bart.; Messrs G. J. Walker, Portlethen; and Irvine of Drum.

On the 5th of March the Directors approved of the names suggested, and added Mr Gillon of Wallhouse, Chairman of the General Show Committee, who was named Convener.

III. *Report by Committee.*

The Committee, in fulfilment of the duty devolved upon them, met on the 15th of October, when the following members attended:—

Sir ALEXANDER JARDINE, Bart.
Sir KENNETH S. MACKENZIE, Bart.
Mr CUNNINGHAM, Tarbreoch.
Mr DUNDAS of Arniston.
Mr GIBSON, Woolmet.
Mr GILLON of Wallhouse.
Mr HENDRIE of Larbert.
Mr HOWATSON of Dornel.
Mr MARTIN, Yr. of Auchendennan.
Mr MOLLISON, Dochgarroch Lodge.
Mr MURRAY, Catter House.
Mr MYLNE, Niddrie Mains.
Mr RALSTON, Glamis House.
Mr SMITH, Whittinghame.
Mr CAMPBELL-SWINTON of Kimmerghame.
Mr G. J. WALKER, Portlethen.

All the other members, with the exception of two, had previously communicated their views in writing.

From information supplied by the Secretary, the Committee find that the places for holding Shows were fully reported on by a Special Committee appointed in 1858. At that time the circuit consisted of seven districts, and the only alteration which that Committee suggested was that Peeblesshire should be disjoined from the Berwick and connected with the Edinburgh district, and that Kelso should be the place of meeting in place of Berwick. The Special Committee appointed in 1858 concluded its report on the places for holding Shows, by recommending that the then existing arrangements regarding districts be adhered to, subject to the modifications referred to, and with an understanding that extra meetings may be held as opportunities offered in Edinburgh and Glasgow.

The Committee may here observe that by a resolution of the Board, 4th February 1863, the county of Peebles was disjoined from the Edinburgh district and again added to the Kelso district, to which it has since been attached.

The only other alteration that has taken place since 1858 was in 1862, when a requisition signed by 720 persons connected with the Stirling district, and praying that the Society's meeting for 1864 should be held at Stirling, was favourably entertained, and a new or eighth district formed, comprising the counties of Stirling and Dumbarton (formerly joined with the Glasgow district), and the county of Clackmannan and the western division of Perthshire (formerly included in the Perth district).

Since that date Shows have been held in regular rotation in each of the eight districts at present visited. The counties embraced in each district, and the order in which the Shows are held, are as follows:—

1. *Kelso*, for the counties of Berwick, Roxburgh, Selkirk, and Peebles.
2. *Stirling*, for the counties of Stirling, Dumbarton, and Clackmannan, and the western division of Perthshire.
3. *Inverness*, for the counties of Inverness, Elgin, Nairn, Ross and Cromarty, Caithness, Sutherland, and Orkney, including Shetland.
4. *Glasgow*, for the counties of Lanark, Ayr, Renfrew, Argyll, and Bute.
5. *Aberdeen*, for the counties of Aberdeen, Banff, and Kincardine, and eastern district of Forfarshire.
6. *Edinburgh*, for the counties of Edinburgh, Haddington, and Linlithgow.
7. *Dumfries*, for the county of Dumfries, Stewartry of Kirkcudbright, and county of Wigtown.
8. *Perth*, for the eastern division of Perthshire, the counties of Fife and Kinross, and western division of Forfarshire.

The Committee find that for some time previous to 1858, it had been suggested that, with railways, it was no longer necessary to hold Shows at Dumfries, Inverness, or Berwick, and that they might even be advantageously restricted to Edinburgh and Glasgow. To this the Special Committee, appointed in 1858, stated the two following objections.

"*First*, Although stock and implements could be forwarded by railway to central points, the great mass of the agricultural public in the northern and southern counties

would be unable to attend, and would practically be debarred from any advantage or gratification which a show is calculated to afford. The Society, as a national body, may fairly be expected to visit each of the leading localities of Scotland, and to furnish the rural population with occasional opportunities of seeing within their own districts breeds of stock not common to them, and of inspecting a full collection of the implements of agriculture. Were such local facilities discontinued, and the Shows fixed at Edinburgh and Glasgow, a large amount of support now drawn from the more distant counties would not improbably be diminished, and the national character of the Society be thus affected.

"*Second*, Any centralised system of shows is inconsistent with the existing mode by which funds for their support are raised. The cost of a show is defrayed, first, by the collection at the showyard gates; second, by a subscription in the district. If there be a deficiency, it is borne by the Society, which on the other hand enjoys the advantage of any surplus that may arise. The amount at the showyard gates depends by no means so much on the agricultural public as on the population of the town within which the show is held. This regarded superficially seems to present a good ground for restriction, but it is apprehended that, were shows held in Edinburgh and Glasgow every alternate, instead of every seventh or eighth year, they would become too common to excite much interest on the part of the towns-people, and that the showyard revenue would rapidly deteriorate. But the principal financial difficulty would arise with reference to the district subscription, which is now managed on an effective and simple principle, and produces a very considerable sum. The plan, which has been in general operation for some years, is for the Commissioners of Supply of the counties forming the district of a show, to recommend a subscription according to a uniform rate upon rental, and to request the County Collector to prepare an allocation, and to apply for payment along with the county rates. By this means the drawbacks and annoyance of canvassing for a subscription are avoided; every proprietor is made aware of the exact sum expected from him; while, owing to the subscription or assessment being universal, the amount, individually, is so reduced as rarely to be objected to. The rate hitherto has run from 20s. to 30s. on the £1000 of rental, and proprietors have been found willing to submit to such an impost once in seven or eight years, and in aid of a meeting to be held within their own district; but it is evident that, while the counties connected with Edinburgh and Glasgow would not agree to a biennial subscription, those associated with Inverness or Dumfries would equally object to raise funds for the maintenance of shows in Mid-Lothian and Lanarkshire. Any centralised system, such as has been occasionally suggested, would most probably diminish the sums drawn at the gates, and necessarily destroy the existing mode of voluntary assessment which is working well, and for which it would indeed be difficult to provide a substitute."

The Committee have considered it their duty to give thus in detail the objections stated in 1858 to any limitation of the places for holding shows, because they apply with equal force at the present time.

As it has sometimes been urged that the Society can do without the pecuniary aid afforded by the local subscription, the Committee deem it proper to observe that among the documents prepared by the Secretary and submitted by him for their information, there was one showing that without such aid the loss to the Society on the eight shows from 1863 to 1871 would have been £6614, while for the rotation 1872 to 1879, it would have amounted to £5041, or a total loss during the double rotation of £11,655.

The Committee deem it proper to give the following summary of the views expressed by some of the members in answer to a circular sent by the Secretary.

Lord POLWARTH thought it not easy to improve on the existing arrangement. The present places really seemed to him to accommodate the various districts admirably. In his own district, Melrose would have some advantage over Kelso, but there is no piece of ground adapted for the showyard. Berwick would be also convenient, but it falls more properly to the Northumberland Society. He could fancy Dundee, and possibly Lanark, as making some claim, but Perth and Glasgow must meet the wants of these districts. His own idea would be to adhere to the present rotation, but that if any place specially petitioned for a visit its claims might be considered. In this way a little variety might be obtained, while yet adhering to the present system as the general rule.

Sir WILLIAM FORBES, Bart.—As the places presently visited by the Society are to be continued, he does not see how any change could be made which would be of advantage either to the Society or the general public. One of the principal points to be kept in view is that the place visited should be well supplied with railway accommodation, and that the supply of water should be plentiful: the generality of the places visited at present are well enough supplied, and where any defects existed last time, may be remedied before another visit becomes due.

Sir KENNETH S. MACKENZIE, Bart., stated three alternatives—(1) other additional places may be visited; or (2) without adding to the number of places, some might

receive more frequent visits than others; or (3) the rotation hitherto observed may be maintained. This last alternative commends itself most to him. He sees no reason for adding to the list of towns in the Society's circuit, but if a change of some sort is thought necessary, he would rather suggest a ten years' rotation, during which shows should be held twice at each of the metropolitan cities of Edinburgh and Glasgow, and once at each of the six provincial towns.

Mr CUNNINGHAM, Tarbrooch.—In favour of shows being held at all the places where they have hitherto been held. The shows might be held alternately at Stirling and Dundee when the year of the Stirling show comes round. Would be in favour of holding the shows at Glasgow and Edinburgh twice as often as the other places, making a ten years' circuit.

Mr MOLLISON, Dochgarroch Lodge, on behalf of himself and the county of Inverness, considers the present rotation highly satisfactory. Would not object to consider the claims of any important centre not now included in the show rotation for being included therein.

Mr MUNRO, Fairnington.—Does not think any alteration required, unless a great many places were taken in, which would be more troublesome to arrange than the present plan, and no corresponding advantage to the country districts, although it would be an advantage to the towns where the show has never been held.

Mr MURRAY, Catter House.—Considers that the Society, which embraces the whole of Scotland, ought to rotate so as to confer its benefits and make its influence felt as equally as possible over the whole country. He thinks, however, that the Society should visit the greater centres of population oftener than the smaller towns, and suggests the following rotation:—(1) Edinburgh, (2) Inverness, (3) Dumfries, (4) Glasgow, (5) Kelso, (6) Perth, (7) Edinburgh, (8) Oban, (9) Stirling, (10) Glasgow, (11) Aberdeen, (12) Dundee.

Mr REID, Cruivie, approves of the present rotation, but it might be considered whether some arrangement might be made to hold the shows more frequently in Edinburgh and Glasgow, Perth and Aberdeen, than in the other places.

Mr CAMPBELL-SWINTON of Kimmerghame, considers no change is required in the present rotation. But for the understanding that none of the places at present visited are to be dropped, he would have been inclined to recommend that Dundee take the place of Stirling, and of substituting for one year Melrose for Kelso, but doubtful if the former place could afford the necessary accommodation.

Mr SMITH, Whittinghame, thinks there should be no change in the districts but it might be of advantage to hold two shows at Edinburgh and Glasgow in each course. In the Perth district the show might alternately be held at Perth and Dundee, and in the Kelso district at Kelso or Berwick.

Mr SETON WIGHTMAN of Courance, was a member of Committee, but died before the meeting. He was of opinion that the eight places as arranged several years ago are very suitable, and appeared to embrace Scotland as fully as the geographical form in connection with the population of the country will permit the Society to do in an efficient manner, along with the support obtained annually from the special district in which the show falls to be held. To increase the number of places by adding Dundee, and perhaps Ayr, it would be necessary to reduce the extent of the Perth district, also to transfer Wigtownshire from Dumfries to Ayr, whereby the local financial contributions might be materially diminished without increasing the success of the shows, agriculturally or otherwise. The breaking up of the present districts of Aberdeen and Inverness would also produce disappointment.

Mr WILLIAMSON of Lawers.—The rotation of the general shows seems to have given much satisfaction. The show could not be held at a fewer number of places, and as there does not seem to be any call from those residing in other localities, he ventured to express the opinion that no alteration in the rotation of the shows be made.

Mr IRVINE of Drum, believes there is some desire for an occasional show at Dundee. In that case, the show now held at Perth might be held alternately at that town and at Dundee.

The members present then expressed their opinions as follows:—

Mr DUNDAS of Arniston was anxious to hear the views of those members who advocated a change. For his own part, he was quite prepared to move that the eight districts at present visited be adhered to.

Mr SMITH, Whittinghame, would have been in favour of increasing the number of shows at Edinburgh and Glasgow, had he not feared a difficulty might arise as to the auxiliary subscription.

Mr G. J. WALKER, Portlethen, speaking for the northern counties, believed the present arrangement as good as any. He did not see that the more populous districts should be visited oftener than the others. He was, therefore, ready to second Mr Dundas' motion.

Mr MARTIN, yr. of Auchendennan, proposed that such a change should be made in the circuit of shows as would admit of more frequent shows at Edinburgh and Glas-

gow. He submitted the following rotation, not as committing the Society to any given circuit, or even to visiting these two places every sixth year, but merely to show how the proposed motion, if adopted, might be carried out.

1. Aberdeen.	7. Inverness.	13. Perth.
2. Dumfries.	8. Stirling.	14. Kelso.
3. Edinburgh.	9. Edinburgh.	15. Edinburgh.
4. Perth.	10. Aberdeen.	16. Inverness.
5. Kelso.	11. Dumfries.	17. Stirling.
6. Glasgow.	12. Glasgow.	18. Glasgow.

Mr Martin supported his proposal on the following grounds, viz.:—(1.) That having a show every third year in either of the metropolitan or central districts would be more convenient to the members as a whole than the present arrangement. (2.) That while it increased the number of these central shows (Edinburgh and Glasgow) by having one or other of them every third year instead of every fourth year as at present, the proposed rotation only postponed the show one year in each of the other districts, as the Society would visit them once in nine years instead of as now in eight. Members in outlying districts would therefore be more than compensated for one year's delay in local visits by the increased number of central shows with their greater convenience and economy. (3.) That the result financially to the Society from shows held in Edinburgh and Glasgow is always so satisfactory that if it was found undesirable to attempt to raise the voluntary assessment in these districts once in the six years (or with two years' shorter interval than at present) every alternative show there might be held free of local contribution without any danger of the funds of the Society having to be drawn upon, those central shows always being sources of large revenue rather than of expenditure. The other districts could not reasonably complain of this arrangement seeing the very different pecuniary result to the Society from shows held in outlying towns, seeing also that they would only be assessed once in nine years instead of in eight as now, and that they would only be called upon to contribute when a show was being held in their district. If, however, a difficulty was still found to exist through the feeling of other counties, it might be overcome by assessing for *every* show, but in varying proportions—say in Edinburgh or Glasgow once in six years, 20s. per £1000; in the other districts once in nine years, 30s. per £1000. (4.) That any other towns found suitable might occasionally be substituted for those named in their respective districts, if the Directors considered this desirable. Also, that the change into the new rotation, if adopted, should not take place at once, but be worked gradually, so as to fit into the present one, without injustice to any particular district; the Directors always having in view as the ultimate arrangement, a show in one of the two great centres every third, with a northern and a southern one in the two intervening years.

After some further conversation, principally in regard to the difficulty that might arise as to the voluntary local assessment if any change was made, it was moved by Mr CAMPBELL-SWINTON of Kimmerghame, and seconded by Mr MYLNE, Niddrie Mains, that the present rotation of districts be adhered to.

It was then moved as an amendment by Mr MARTIN, yr. of Auchendennan, and seconded by Mr HOWATSON of Dornel, that alterations be made so that Edinburgh and Glasgow are more frequently visited than the other districts.

On the motion being put it was carried by 10 to 6.

The following voted for the motion—Sir Alexander Jardine, Sir Kenneth S. Mackenzie, Messrs Dundas, Gibson, Gillon, Mollison, Mylne, Campbell-Swinton, Smith, and Walker. And the following were in favour of the amendment—Messrs Cunningham, Hendrie, Howatson, Martin, Murray, and Ralston.

The report was adopted.

DISCOVERY OF FALSE HAIR ON A PRIZE FILLY.—The SECRETARY laid before the meeting correspondence with Mr David Riddell, Blackhall. He had received the following certificates by Professor Williams and Sir Alexander Muir Mackenzie, Bart.:

"Showyard, Perth, 31st July 1879.—I have examined Clydesdale mare, No. 519, and found that she has false hair on her forelegs. Hair enclosed.—(Signed) W. WILLIAMS. I was present at the above examination.—(Signed) ALEX. M. MACKENZIE, member of Local Committee." A correspondence followed between himself and Mr Riddell, which he laid on the table. The last letter which he was ordered to write to Mr Riddell was in these terms:—

"10th December 1879.—Dear Sir,—The directors have again had the case of false hair on your filly's (No. 519) legs at Perth Show before them. I am directed to intimate to you that they are not satisfied with your explanation, and that they have no doubt that false hair was fixed into the filly's legs. As, however, this was not discovered till after the judging, and as it is possible that the false hair may not have been inserted till after the judging was over, the directors, after long deliberation, have determined not to put the regulations of the general shows in force against you

on this occasion ; but I was instructed to inform you that should anything of the sort occur again, or any other of the Society's regulations be contravened, you will be held answerable, whether the breach of the rules has been the act of your servants or of others, so long as your animals are in the showyard, and that the regulations will be strictly adhered to. I enclose a copy of the regulations, and beg to draw your attention to rules 12 and 27.—Yours faithfully, (Signed) F. N. MENZIES."

Mr COWE, Balhousie, wished to ask the directors if they had not had their attention drawn to a case of false entry ?

The noble CHAIRMAN said that that question was entirely out of order. If Mr Riddell had anything to say on the case they would be happy to hear him, but it was out of order to take up any case that had nothing to do with Mr Riddell's.

Mr SMITH, Whittinghame—It would be desirable for the meeting to hear the reply Mr Riddell gave in writing.

Mr MENZIES—There was no reply to the last letter. The reply Mr Riddell formerly sent was ;—

"Blackhall Farm, Paisley, 10th Nov. 1879.

"Dear Sir,—Your note to hand regarding a report to the directors of hair being placed on my filly's fore leg, 519 in catalogue. I may tell you I deny it most emphatically, to my knowledge. I have been making inquiry at all my servants, and they say if it was, it was not done with them ; neither did they see any one do it, nor even the two credible witnesses taking it out. Perhaps you will give me the names of the two parties that alleged doing so.—I am, faithfully yours,

(Signed) "D. RIDDELL."

The noble CHAIRMAN said he was very sorry it should have been necessary to lay this correspondence before the meeting, and he quite concurred in what the directors thought right to do, because they gave Mr Riddell the benefit of any doubt as to when this false hair was put on. But he thought it was absolutely necessary that exhibitors should understand that when anything was found wrong and not straightforward, they must be held responsible for the doings of those under their control. This was not a case at all of wishing to fine anybody who had done wrong ; but they must remember that in a case of this kind, if anything was wrong, it was not the advantage it did to the wrongdoer that was most to be considered, but the disadvantage it did to the other exhibitors. As Mr Riddell said he did not know that what was complained of had been done, he took it for granted that he did not, but the evil effects of what had been done must have been felt by others who might have had the prize in its place. Therefore, he only wished to call the attention of exhibitors to this, that they must in future consider themselves responsible for the state of their animals during the whole time they were in the show, and that all the rules of the Society must be put in force.

Sir WILLIAM BAILLIE of Polkemmet, said he should like to say, as an old member of the Society, that he thought the directors in this case had come to a very happy and very kind verdict.

The subject then dropped.

THE EXHIBITION OF POULTRY.—The Hon. GEORGE WALDEGRAVE LESLIE moved—"That it is desirable at future shows of the Highland Society to dispense with the exhibition of poultry, &c. ; and to make arrangements with the Edinburgh Christmas Club for the exhibition of poultry, &c., at their annual shows in December, when the poultry are in full feather," &c., &c. In supporting the motion, he said he believed it was patent to all that poultry were not in good condition to be exhibited at the time the Society's shows were held, and that it would be better that the exhibition should take place in the month of December, at the Edinburgh Christmas Club Show, when the poultry were in good feather and form. He thought it would be desirable to see if the Society could not make arrangements for the exhibition being held then, instead of at the show of the Highland and Agricultural Society.

Sir JOHN DON WAUCHOPE, in seconding the motion, said—that it was to a large extent throwing away money to give premiums as at present.

Admiral MAITLAND DOUGALL said that he would not like to cut any of the roots that went to make the Highland and Agricultural Society's Shows popular. They were indebted to the active mind of Mr Leslie for many improvements, but this motion was entirely in the wrong direction. It was not every one who could compete at the Society's shows with shorthorns or horses, and to take away the opportunity of competing in the poultry department was very inadvisable. At the time of the show all the young birds were in excellent plumage, and it was only a certain proportion of the birds that were not in good condition. He preferred to have the poultry shows outside rather than in drill halls or other places where the light was bad, and where it was extremely difficult to carry on the judging in a proper manner. He thought that, considering the importance of poultry as an article of food for the people, instead of their doing anything to stop the exhibition, they ought to give it a little more encouragement. Besides, a great many ladies took an interest in the poultry department, and

they should consider well before they withdrew such an attraction. They ought to remember also that this was a department of the show in which the poor man could take part. He moved the previous question.

Sir WILLIAM FORBES of Craigievar seconded the amendment.

Mr ELLIOT, yr. of Wolfelee thought that the proposal by Mr Leslie would have a tendency to confine the show too much to the Edinburgh district, and steps might be taken to promote the exhibitions of poultry in the different districts where the summer shows of the Society were held.

The noble CHAIRMAN said he himself was inclined to be in favour of the interests of the ladies and the poor exhibitors. He wished all success to the Edinburgh Christmas Club Show, but they must first consider the interests of the Highland Society, and it would be a pity to cut off anything that created an interest in the Society. They did not know how much the interests of the Society might be promoted by the wives who took a special interest in the exhibition of poultry. Perhaps many exhibitors would not be there at all if they had not their wives to back them up.

On a division, the amendment (the previous question) was carried by a large majority.

THE CHEMICAL DEPARTMENT.—Mr MACKENZIE of Portmore, convener of the Committee on the Chemical Department, said I have to report that the experimental stations are being dealt with in a successful manner, and that a report upon the results obtained this year will be submitted to you by Dr Aitken, the Society's chemist. I have also to report that Dr Aitken gave public demonstrations upon the scheme of cultivation at the station at Pumpherston early in September, which were well attended, and gave much satisfaction. I have the pleasure to report that a course of lectures upon fodder and animal nutrition has been given by the chemist in this hall, and which has been attended by from eighty to a hundred gentlemen. The resolution which was passed at the general meeting at Perth to the effect "that the Society subsidise their chemist so that he would be able to give the members analyses at the same rates as local associations do," was referred by the directors at the first meeting held subsequent to the Perth Show to a committee composed of the committees on the Chemical Department and on Finance, with the addition of Mr W. P. Hope, Leith, the mover of the resolution. This committee has held several meetings, at which the constitution and financial arrangements of local analytical associations, and the advantages enjoyed by their members in regard to analyses have been the subject of inquiry and discussion, and at which also it has been discussed how the instructions of the Society can best be carried into practical effect: and they were aided in this direction by an explanation afforded by Mr W. P. Hope of the meaning which he attached to the somewhat general wording of the resolution. Eventually the committee, after very careful consideration of the matter in all its bearings, resolved to recommend to the directors to place the following proposals before this general meeting, not as emanating from themselves, but simply as what appears to them to be the most practical method of carrying into effect the resolution of the general meeting at Perth:—"That the motion carried at the general meeting may be held as rescinding any understanding which previously existed that no part of the Society's funds should be appropriated for the cheapening of analyses to members. That the most simple method of giving effect to the motion is to diminish the charges to members for analyses of manures and feeding stuffs, by say one-half, the other half of the fee being made chargeable on the Society's funds. That the amount of money so expended for any member shall not exceed 10s. annually. That the arrangement be made subject to there being sufficient funds at the disposal of the directors for the purpose." The directors approved of the proceedings of the committee, and in accordance with their instructions this report is made to the meeting.

Mr SCOTT DUDGEON, Longnewton, said he was strongly of opinion that the Highland and Agricultural Society was making a mistake in attempting to devise means whereby they would come into competition with local analytical associations, and militate against their usefulness. The benefits which had accrued to agriculture by the operation of these local associations were not sufficiently appreciated by farmers' associations, and were almost totally ignored by the proprietors. He believed that there existed at least as many as twenty-four of these local associations, there might be more, scattered over the length and breadth of Scotland, and through their agency no fewer than 700 analyses of manures and feeding stuffs were annually effected. These manures and feeding stuffs were not only analysed, but the names and addresses of sellers and buyers, the price charged for the manures, and guarantees given, as well as the results, were circulated in different localities amongst the members. He thought that these things should be considered well before the Society took any action whatever, and interfered with or checked the good work that was being done by the local associations. It was only within the last eight or ten years that the farmers had become impressed with the value of these associations, which, if left alone, would spread and extend their benefits more and more. No better testimony could be furnished to their efficiency in any locality than the increasing rapidity with which each

district was establishing fresh stations. Had the Society some fifteen years ago proposed some action of the kind, there would have been some good reason for it, and some prospect of its doing good to the farmers, as well as being some credit to the Society; but to take action in the way proposed would only be to have a disturbing effect. It could not be said that a Society such as this could compete in point of efficiency, far less in point of economy, with these local associations. The one great object they had in view by the analyses was to prevent imposition and protect the farmers, and surely that could be better done by those who knew the sellers and buyers than by a central body in Edinburgh. The Royal Society of England had for many years offered considerable encouragement to its members at reduced rates; but even with their eminent chemist, Dr Voelcker, he would ask, how did the amount of work done by that Society compare with the work that was being done by the associations in Scotland? There were not more than 400 samples of manures, including limestone, and 200 samples of feeding stuffs—600 in all—analysed in England, against 700 now being analysed annually by the local associations in Scotland. Such a comparison could not but show the futility of the Highland and Agricultural Society undertaking such work. Then, in regard to economy, the one analysis obtained from these local associations protected a great many different farmers, and he believed that by the expenditure of half a crown through these associations as much good could be done as by a pound through the Society. If the Society wished to assist in the good work of checking adulteration, that could be done much more efficiently by subsidising, not the chemist, but the analytical associations throughout the country. If each analysis cost half a crown, that would be less than £100 for the 700 analyses, and that would have a very material influence in cheapening the cost of analyses to farmers in general throughout Scotland. He thought that the results should be published in the Society's "Transactions" every year, and this would have a deterrent effect on adulterators. He concluded by moving that the motion of Mr Hope, carried at the meeting at Perth, be referred back to the directors for further consideration.

Mr Hugh Lindsay, Meadowflatt, seconded the motion. He said that he had been connected with one of the local associations for some time, and he was convinced that the analyses could be supplied by these associations at a much cheaper rate than the Highland Society could possibly do. If the proposal were carried out, it would interfere with their chemist's legitimate business. He was appointed to carry out scientific investigations, and this, he thought, was quite sufficient work for him to do. If he was not sufficiently paid at present, then let his salary be increased.

Mr Falconer King, Edinburgh, said he did not think the Society had money to throw away upon the system that was now proposed, and by which they would be spending money quite gratuitously. He thought it would be better to augment the chemist's salary. At present he was most miserably paid for the work that he did. He thought he should stick to the scientific investigations which could be done by the Highland and Agricultural Society, and by such a man as Dr Aitken, who he believed was well-qualified for the work. If the proposed plan were adopted they would be thrown back on the system they had under Dr Anderson, which gave much dissatisfaction. They were just on the precipice, and another step would bring them to where they were before. The chemist would have no time to make scientific investigations at all if he were to be engaged in these analyses. The chemist's time would be taken up with making analyses which farmers could get for half a crown, and valuable work would be thrown into the background. He supported Mr Dudgeon's motion.

Mr N. W. P. Hope, Leith, who had just entered the room, asked if his motion, which was agreed to at Perth, could be dealt with in the way that he understood had been proposed?

The Secretary said that the directors were bound to report everything to the general meeting. It was remitted to the directors to carry out Mr Hope's motion, and it was their duty to report what had been done.

Mr Hope said that it was not within their power to discuss the motion, but only what the directors in committee recommended.

The noble Chairman said he did not approve of motions being passed and then rescinded, but it was entirely within Mr Dudgeon's power to propose the motion which he had made. He did not like to give his own opinion from the chair, but he confessed that he entirely agreed with Mr Scott Dudgeon's motion. The committee and directors were bound by the decision of the Society, and on that they had drawn up their report. That being the case, it was within the power of a member to make a motion on the subject.

Mr David Cross, Glasgow, said that there was no remit to the directors on the subject that he could see.

Mr Scott Dudgeon said that the committee had drawn up a report on the subject trying to carry out Mr Hope's motion. They were going to charge 10s., while they knew that analyses did not cost members of the association more than 3s. or 4s.

Mr Cross held that it was not in order to make the motion Mr Dudgeon had proposed.

The noble CHAIRMAN said he understood that Mr Dudgeon was not satisfied with the report laid before the meeting in regard to Mr Hope's motion at Perth, and he wished it to be remitted back for another report.

Mr HOPE asked if it was perfectly understood that Mr Dudgeon meant the report of the directors as to how they were to carry out the motion, and not the motion itself?

Mr DUDGEON said it was well known that he objected to the motion, but he wished it to be remitted back for further consideration.

Mr HOPE wished to know if the committee who had reported on the subject wished to have longer time to consider it. They would all agree that if the benefits of the motion were to be got for the farmers, the sooner the better. The committee would be able to tell them whether by sitting on the question other three months or six months they would get more light upon it than they had now. He moved—"That the recommendation of the committee be carried into effect."

Mr CROSS said he failed to see that they could on any principle whatever make a motion to approve of what had already been carried.

The noble CHAIRMAN said that this was the first general meeting since the report had been drawn up, and members were at liberty to say whether they approved of its terms.

Mr BETHUNE of Blebo said it appeared to him that the proper way would have been to have withdrawn the report. He thought that if Mr Hope had heard Mr Dudgeon's remarks he might have been converted to a more excellent way.

Mr MACKENZIE said that when the motion was referred by the directors to the committee, they had great difficulty in making out what was the exact meaning of the motion. They thought it right, before recommending the directors to take any action, that it should be put before the meeting, to see whether the directors' interpretation was correct and in accordance with their desire.

Mr M'CULLOCH, Denbie Mains, seconded Mr Hope's motion.

Dr STEVENSON MACADAM, Edinburgh, said he belonged to one of the oldest analytical associations—he believed it was the first—the Kelso Association, which had been in existence since 1859. It had done an immense amount of good there. At first there was no end of adulteration in the district. They were threatened with actions of damages; but now-a-days, with the assistance of these local associations, it was very difficult for a chemist to find adulterated articles. It might be said that in the Kelso district they had stamped out adulteration so far as the members of that association were concerned. Mr Dudgeon was within the mark when he said that an analysis only cost 3s. or 4s., and the same analysis might benefit fifty or a hundred members. Besides, with the constant communication going on between vendor and purchasers, the local associations could do much more good in the various districts than could be done by the Society in Edinburgh. If Mr Hope's proposal was carried out, the Society would have to provide a laboratory in connection with the analyses, which would involve an expenditure of several hundreds of pounds.

Mr CLAY, Kerchesters, said that he could corroborate the statement of Dr Macadam, having been a member of the Kelso Association for several years. He would have been inclined to move a direct negative to Mr Hope's motion, because he believed that, with reference to this matter, the local associations would do, he would not say better, but as well as the Highland Society.

Mr PEILE, Greenock, said he would like to know if there was any prospect of the Highland Society publishing the results of adulterated manures. Small societies that had no money at their back were frightened when they had an action of damages raised against them, and they could not open their mouths. He thought it was the duty of the mother society to protect the whole of Scotland. He quite approved of what Mr Dudgeon had said.

Mr MACKENZIE said that six months ago the Highland Society adopted a scheme of publishing cases of gross adulteration when information was given in certain forms.

Mr PEILE said that no report appeared in the last volume.

Mr MACKENZIE said that it had not yet been published, but the proposal was a standing order of the Society.

Mr HOPE said there was nothing in his motion that carried the semblance of opposition to the local associations. His motion pointed more to the educating of farmers in the processes of buying and selling. He was perfectly sure that at the present moment the farmers of Scotland very much required the guidance and support of a Society of this kind.

On a division, Mr Dudgeon's motion was carried by a large majority.

Mr DUDGEON gave notice that at next general meeting he would move a resolution to rescind Mr Hope's motion.

THE EXPERIMENTAL STATIONS.—Dr AITKEN said that in the report which he gave six months ago, he drew attention to some of the results obtained at the experimental station of Harelaw by the application of various forms of phosphatic manure to Swedes. These results were arranged with the view of instituting a comparison

between dissolved and undissolved phosphates, and showed that while the application of dissolved phosphates produced the larger crop, yet the increase was due to the greater amount of water in the bulbs, and that the total quantity of solid matter per acre was really diminished by the application of that form of phosphate. A considerable part of that deficiency was borne by the albumenoid matter, and thus a marked diminution in the feeding quality of the bulbs was indicated. The estimation of the ash also showed that the decrease of animal food per acre was accompanied by an increased abstraction of mineral matter from the soil; and it seemed as if the application of phosphates in the dissolved form to the turnip crop had the effect of hastening the impoverishment of the land without proportionately enriching the animals fed on it. He thought it expedient to lay before them, at the earliest opportunity, some of the results obtained with the barley crop upon the corresponding plots at the other experimental station during the season just past. The seed was sown on the 21st May, but, owing to the cold sunless summer, the crop was not ripe until the last week of September. That long period of four months was favourable to the growth of the crops, which had received slow-acting manures; and from observations taking during frequent visits, it was noticed that these plots made a growth late in the season, which they could not have done had the summer been hot and dry. Of the phosphate plots, it was noticed that those with dissolved phosphates were the first to ripen, and this corresponded with what was observed regarding the turnip crop of the former season at both stations. The advantage was in favour of the dissolved phosphates in every instance except in the case of one plot; and this exception was able to be satisfactorily accounted for—the soil on that plot, owing to a treatment it received before coming under their care, being superior to any other on the station. From the results obtained at Pumpherston, it was apparent that the barley grown on the plots with undissolved phosphate contained a larger percentage of water, and was less regular in its composition. The increase of solid matter in the barley grown with dissolved phosphates amounted to full 1½ per cent. The dissolved phosphates produced 182 lbs. per acre, or about 16 per cent. more solid matter per acre than the others. The analysis of this solid matter showed that, unlike the case of the turnips, a considerable proportion of that increase was due to albumenoid matter, the increase amounting on the average to about 1 per cent. As regards the amount of mineral matter contained in the crop, it was found, as in the case of the turnips, that those crops which received dissolved phosphates contained the most. In view of the interest which had recently attached to the question of the action of phosphates on the turnip crop, a yearly investigation of that subject was much to be desired; and it was with pleasure that he had to acknowledge the obligation they were under to the Marquis of Tweeddale, who had this season repeated some of the more important of their experiments with phosphates upon the home farm of Yestermains. The detailed results of these experiments would be published in the "Transactions" along with the results of their own stations, as it was Lord Tweeddale's intention that they should form an adjunct to the experiments of the Society, and be continued year after year. He conducted a series of pot experiments under glass at Liberton. They were an exact duplicate of the Society's plots, laid down with great accuracy, and were put under the care of Mr Thomas White, to whose skill and attention the success of the experiments is due. The results obtained in the phosphate pots were quite confirmatory of those obtained in the field. Here the dissolved phosphates produced half as much again as the undissolved, both in grain and straw.

HALL AND CHAMBERS.—Mr JOHN ORD MACKENZIE of Dolphinton gave in the report of the Hall and Chambers Committee, which was to the effect that they held two meetings—namely, on the 17th December and 6th January—when, after very careful inquiry, it was resolved to report that they had failed to find suitable premises in the Old Town, and that only three alternatives appeared to them—First, That the present hall be converted into a laboratory, and accommodation for the general meetings found outside; or, second, that rooms be rented in India Buildings for a laboratory; or, third, that the Directors be authorised to purchase any suitable premises that may come into the market, whether in the Old or New Town. The Directors approved of this report; and Mr Mackenzie suggested that the matter should be remitted back to the committee with such instructions as the present meeting might think proper to give.

The noble CHAIRMAN said he thought it was very doubtful whether a general meeting like this would give any definite instructions.

Mr MACKENZIE of Portmore said it would be utterly impossible to buy premises if the committee had to come and get the sanction of the general meeting. If it were known that the Society was in the market for certain premises, their cost would be certain to be up 50 or 100 per cent. It would be better if the Society could be induced to give the Hall and Chambers Committee some instructions.

The noble CHAIRMAN thought there could not be a better way of raising the value

of property than giving the committee instructions how they could buy the first suitable premises in the market.

Mr Mylne, Niddrie Mains, thought the meeting might give authority to procure premises for a laboratory.

Mr Ferguson of Kinmundy moved—"That power be given to the Hall and Chambers Committee in reference to the third suggestion, and that in the meantime the committee have power to take temporary premises for a laboratory if they see fit."

Mr Melvin, Bonnington, said it seemed to him that, in the present state of the Society, it would be very injudicious in them to leave their present premises; but, as the chemist must have accommodation for carrying out the experiments in connection with the experimental stations, he thought they should simply adopt the proposal to give the directors power to look out for premises to allow the chemist to carry on his experiments.

This proposal was agreed to.

Revision of the Charter.—Mr T. G. Murray, W.S., gave in the report of the committee on the motion adopted at Perth to the effect that a committee be appointed to revise the Society's charter, and consider any changes which the altered state of matters now existing may render necessary. On communication with Mr Mollison, the mover of the motion, it was found that what he proposed was that the charter should be revised to the extent of not making it imperative that the directors should be chosen from the members of the Society usually resident in Edinburgh; and that in regard to the extraordinary directors, the number should be increased, and a proportion of them at least chosen from the district in which the show of the year is to be held. The directors were quite agreeable to these alterations as proposed. The question then came to be—How were these to be carried out? He might say that he would advise the Society to be very cautious how they went for a supplemental charter or revision of their charter. If they did so they must go before that department of the officers of the Crown who had charge of such matters, and that department not only held that they had power to deal with the provisions proposed, but the provisions of the previous charter. They therefore, while knowing what their condition was before they went to the department, did not know what it might be before they came out. But it so happened, very fortunately, that alterations proposed could be effected without any supplemental charter or revision of the charter. The charter contained within itself a power authorising the Society to alter the provisions of the charter in regard to certain points, and amongst these was the composition of the body of the directors. It was therefore within the power of the Society to pass a bye-law which should declare what was to be the condition under which the directors were to be elected. He consequently proposed the following bye-law, which would carry out the alterations desired:—"The Society shall annually, at the general meeting in January, choose out of the ordinary members a board of thirty directors, special regard being had to the convenience of one-third of that number for attending meetings of the board held in Edinburgh. The Society shall also at same meeting choose twenty extraordinary directors, of whom at least ten out of the whole number to be resident in the district in which the show of the year is to be held." The bye-law which regulates the duration of office would be altered to the effect that the ten senior extraordinary directors should retire annually. With these explanations Mr Murray concluded by moving the adoption of the report.

The motion was unanimously agreed to. The bye-laws will come up again for confirmation at next general meeting.

District Competitions.—Mr Campbell Swinton of Kimmerghame said—I have to report that the system of district shows continues to receive the lively support of the Society, and that during the past year money premiums or medals have been in operation in 200 districts—namely, stock, 43; minor premiums and medals, 59; ploughing competitions, 98. The premiums awarded amount to £812 10s. 6d. The directors have been for some time engaged in adjusting the premiums for the current year, and it has been their endeavour to dispense the Society's grants to local shows among those applying in the manner most consistent with the claims of the different districts. The directors have therefore to propose that premiums should be given to 10 districts for cattle; 7 for stallions, and a similar number for mares and for colts and fillies; 10 for sheep; and the usual number of medals in the intermediate years in the classes of cattle and sheep. The special grants consist of £50 and a medium gold medal to the Edinburgh Christmas Club; £20 to the Ayrshire Agricultural Association in aid of the Dairy Produce Show at Kilmarnock. To the Rousay, Westray, Orkney, Egilshay, and Unst Societies it is proposed to continue the small grants of £3 to each. Also the usual number of medium and minor silver medals to agricultural and ploughing societies—making the total sum offered amount to about £1000.

Cottage Competitions.—Mr Campbell Swinton, in the absence of Mr Maxwell Inglis of Loganbank, next said—I have to report that during the past year competitions have taken place in twenty-four parishes or districts, and that £35 10s. in money and

seventy medals of the value of £25 14s. 6d. have been awarded. Several of the reports showed that the various committees had taken much trouble in making the awards, there being 97 competitors for the cottage premiums, and no fewer than 357 for the gardens or garden produce. The state of the interior and exterior of the cottages, as well as the choice and quality of the crops of the gardens, are generally reported to be very good; while many of those to whom prizes were given are described as excellent. For 1880, the directors have to ask the meeting to sanction similar premiums in thirty-one parishes or districts.

THE "TRANSACTIONS."—The SECRETARY said that in the absence of Sheriff Irvine, who was obliged to be in Argyllshire on magisterial business, and of the Rev. Mr Gillespie, the mover of the motion which led to the appointment of the committee, who was unable to be present owing to the death of a relative, it devolved upon him to present their report on the "Transactions." He moved that the report, which was adopted by the directors, be approved of by the meeting; and that the necessary authority be given to the directors to carry it out. The report is as follows:—

REPORT by SPECIAL COMMITTEE of the HIGHLAND and AGRICULTURAL SOCIETY on the Mode of Procuring Papers for Publication in the "Transactions" of the Society.

At the Anniversary General Meeting of the Society, held on the 15th of January 1879, it was resolved, on the motion of the Rev. John Gillespie, Mouswald, "That a Committee, composed of Directors and other members of the Society, be appointed to consider and report what improvements, if any, can be made in the "Transactions" of the Society, and especially whether any change in the present mode of procuring papers for publication can be introduced with advantage—the report to be made public before the General Meeting of the Society in January 1880, with the view of its being disposed of at said meeting."

The Committee appointed consisted of Mr Elliot, East Nisbet; Rev. John Gillespie. Mr Hutchison of Carlowrie, Mr Irvine of Drum, Mr Mackenzie of Portmore, Mr Newton of Castlandhill, Mr David Stevenson, C.E.; Mr Scot Skirving, Edinburgh; Mr Walker of Bowland, C.B.; Professor Wilson—Mr Irvine of Drum, convener.

The Committee met on the 29th October and 26th November, and having considered the matter remitted to them, and heard the opinions of the several members, beg to make the following suggestions:—

I. That the present system of procuring approved reports and other papers by competition should be restricted to subjects which are of acknowledged importance, and to such as are specially suitable for a competitive system; that all the reports under this head must be of a practical character, containing the results of the writer's own observation or experiment.

II. That the Standing Committee on Publications should fix additional subjects, and procure from well-qualified writers papers upon them. The main reasons for suggesting this branch are—*First*, Because many of the members and others best qualified to contribute to the literature of the Society have either not done so at all under the competitive system, or at most to a much more limited extent than is desirable: and while an increase in the prizes offered would probably not induce them to compete, it is believed they would respond to an invitation addressed to them personally, in the name of the Society, to supply papers on specified subjects, regarding which they are acknowledged authorities. *Second*, Some important subjects are of a nature unfitted for competition, such as those regarding which personal inquiry at a considerable number of individuals is necessary.

III. That it should be more generally known, by occasional advertisement in the newspapers or otherwise, that the Society will welcome papers from any contributor on any suitable subject; and that if the topic and the treatment of it are both approved, the writer will be remunerated and his paper published. This branch has long been notified in the premium list, and is continued, because it might induce volunteer writers to supply valuable papers on subjects which might not be embraced in either of the other parts of the scheme.

IV. That the Committee should obtain the service of well-qualified persons, who would supply to the "Transactions" abstracts of the most important papers on agriculture, both in home and foreign journals, so as to render the "Transactions" a kind of mirror of the progress at the time.

The plan of the work would thus comprehend the following heads or divisions:—1. Reports received under the competitive system. 2. Reports on selected subjects by competent writers. 3. Reports by volunteer writers on subjects not embraced in either of the two first heads. 4. Abstracts of papers on agricultural subjects from home and foreign journals. 5. Reports on the progress of the experiments at the Society stations; abstracts of reports at board and general meetings; and other official documents.

This report was approved of.

In answer to Mr Lawson, Sandyford.

The SECRETARY stated that the committee appointed parties outside of their number to read the report. For instance, with a report upon a county, gentlemen were selected to read it who had acquaintance with the facts.

Mr M'CULLOCH, Denbie Mains, said he had found that some of his reports had been examined by his next-door neighbour, who could detect his handwriting. If he had known that was to be done he would not have sent in his report, because there were political and other influences that might operate unduly. He thought that the names of those who read the reports should be published.

Mr LAWSON stated that he had known his next-door neighbour have reports submitted to him which he had written.

The CHAIRMAN said he was glad that this subject had been brought up, and that the matter would be taken into consideration by the directors.

PREMIUMS AWARDED IN 1879 FOR REPORTS.—Mr MACKENZIE of Portmore gave in the report on the premiums awarded last year for reports.

The report was adopted.

AGRICULTURAL BURSARIES.—Professor WILSON then said—I have to report that the examination of candidates for the Society's bursaries took place on the 29th October, when Andrew Chapman, Breckonhill, Lockerbie; William Craig, Monktonhill, Ayr; William Martin, Dardarroch, Dunscore; James Sutherland, Wick; William R. Tait, Wick; and David Wallace, Balgrummo, Leven, passed for bursaries of £20 each; and Wm. Brown, Watten, Wick; and Alexander Reid, Watten, for bursaries of £10 each. The examinations, which were conducted by Professors Wilson and Balfour, embraced the elements of botany, chemistry, physical geography, and geology.

The society approved of the report.

Mr MACKENZIE of Portmore moved a vote of thanks to the noble chairman for presiding; and the proceedings terminated.

REPORT OF THE SOCIETY'S VETERINARY EXAMINATIONS.

FIFTY-SIXTH SESSION, 1878–79.

The Examination for this Session took place on the 7th, 8th, and 9th April. The following gentlemen composed the Board of Examiners: *Botany*—Professor Balfour, Dr Cleghorn of Stravithie, St Andrews. *Chemistry*—Dr W. Craig, A. Inglis M'Callum, Dr Douglas Maclagan. *Anatomy*—Dr Dycer, C. Cunningham, Slateford; A. Spreull, Dundee. *Practical and Clinical Examinations*—Thomas A. Dollar, London; Finlay Dun, 2 Portland Place, London, W.; Tom Taylor, Manchester; John Lawson, Manchester; John Steele, Biggar; John Borthwick, Kirkliston; C. Cunningham, Slateford; Andrew Spreull, Dundee. *Physiology and Histology*—Dr Dycer, C. Cunningham, Slateford; Andrew Spreull, Dundee. *Materia Medica*—Professor Balfour, Professor Douglas Maclagan, Finlay Dun, Dr Craig, A. I. M'Callum. *Diseases of Horses*—John Borthwick, Kirkliston; John Lawson, Manchester; Tom Taylor, Manchester. *Diseases of Cattle, Sheep, Swine, and Dogs*—Thomas A. Dollar, London; J. Steele, Biggar. *President of the Board*—Dr Dycer, Edinburgh. *President of the Clinical Board*—Thomas A. Dollar, London.

The distribution of prizes took place in the hall of the Society. The chair was occupied by Mr Gillon of Wallhouse.

The CHAIRMAN said he did not need to say how much they deplored the melancholy circumstance that called on him to preside on that occasion. They would all be aware of what had happened. By the demise of Captain Tod of Howden, in the prime of life, the Society had lost a very valuable, able, and zealous member. And he might say that the veterinary department of the Society particularly had suffered a very great loss indeed, for he knew no one who took such an interest in that department as Captain Tod, who had filled the position of chairman of the veterinary department of the Society since 1872, the same year in which he (the Chairman) was appointed to the chairmanship of the Society's General Show Committee. Captain Tod had endeared himself to the members of the Society in many ways, and had made amongst them very many friends; and all of them would lament his death, not only because of his connection with the Highland Society, but because of his usefulness in many other spheres of daily life. He himself would lament Captain Tod very particularly, because the Captain was not only a valued friend of his own, but he was major in the regiment of Linlithgowshire Volunteers which he had to command, and he (the Chairman) would have very great difficulty, he was sure, in supplying Captain Tod's place. He had no doubt that some gentleman present would propose that a minute be drawn

up recording the loss the Society has sustained in the death of Captain Tod, and the regret felt by the members of the veterinary department of the Society—this record to be submitted to the general meeting for their approval. As to the object of their present meeting, most of them would be aware that in 1881 the Society would drop holding examinations in the veterinary department, having made an arrangement with the Royal College of Veterinary Surgeons, by which the holders of the Highland Society's certificates were to be admitted as members of the Royal College. They had been compelled to make this arrangement owing to the opposition given by the veterinary profession as a body, with very few exceptions, to the Society getting a charter for itself. He was sure they made uninterrupted attempts year after year to get a charter, and no one aided them in these attempts more than his Grace the Duke of Buccleuch—and he was sure every member of the Veterinary Committee strove to the utmost to bring about such an event, which would have been a grand thing for Edinburgh—he meant the Highland Society getting a veterinary charter for themselves. He thought the veterinary profession was well worthy of a college of its own in Edinburgh. It remained to be seen whether the step the Highland Society had been compelled to take would be of ultimate benefit to the veterinary profession. Seeing, then, that the time wherein the Highland Society could grant certificates would so soon expire, in 1881, he trusted those gentlemen who now held certificates of the Society, and those who might be successful in obtaining certificates between the present time and 1881, would appreciate the many advantages they would derive from the Society by holding these certificates, which would in a coupley of years become very rare indeed ; and he hoped that they would by their conduct and character and professional career do honour to the Highland and Agricultural Society. In conclusion the Chairman made some reference to the past history of the veterinary department of the Society, which originated about 1823, when the Society started Professor Dick. The movement was supported by many noblemen and gentlemen who at that time saw clearly the effects of the want of veterinary science in the country. There were, of course, many cow doctors and horse leeches going about the country doing the best they could, but they had no science in them. Since 1823, when they started Professor Dick in his lectures, veterinary science had increased more and more, until the present time ; and, looking back to the period when his connection with the department commenced, in 1847, he could say, from his personal experience, no body of gentlemen had advanced more in the social scale than those who had devoted themselves to the study of this science. He earnestly advised the students to follow up their studies even after they had entered into practice, and develop in themselves further knowledge, which might lead to greater skill and proficiency in the profession.

The SECRETARY (Mr F. N. Menzies) then distributed the honours to the students.

The following are those who received certificates:—J. Allan Frost, Limerick; William H. Hill, Sunderland; A. Mackenzie, Woodside, Keith; George M. Mitchell, Garvald Grange, Prestonkirk; Robert B. Prentice, Longford, Ireland, *Society's gold medal for best general examination*—Charles Rutherford, Edinburgh.

The SECRETARY said, with regard to what Mr Gillon had said about the veterinary department of the Society, a history of it had been compiled from documents in the archives of the Society, and would be published in the "Transactions," so as to hand a record down to posterity of what the Society had done in this department of science.

On the motion of Dr DYCER, seconded by Professor WILLIAMS, it was agreed that the Secretary draw up a minute expressive of their regret at the death of Captain Tod.

A vote of thanks was then passed to the Board of Examiners on the motion of the CHAIRMAN; and after a similar compliment to Colonel Gillon for presiding, on the motion of Dr DYCER, the proceedings terminated.

PREMIUMS AWARDED BY THE SOCIETY IN 1879–80.

I.—REPORTS, 1880.

AGRICULTURAL.

1.	James Macdonald, Aberdeen for a Report on the Agriculture of the County of Sutherland,	£30	0	0
2.	Primrose M'Connell, Castlemains, New Cumnock, for a Report on Insects which prey upon Agricultural Plants,	10	0	0
3.	John M'Culloch, Denbie Mains, Lockerbie, for a Report on the Supply of Labour during press of Agricultural Work,	10	0	0
4.	John M'Culloch, Denbie Mains, Lockerbie, for a Report on Making and Curing Butter,	10	0	0
5.	David Archibald, Duddingstone, South Queensferry, for a Report on the Cheviot Breed of Sheep,	10	0	0
6.	David Watson Wemyss, Newton Bank, St Andrews, for a Report of Improvements on the Estate of Denbrae,	10	0	0
7.	Thomas Lawson, Sandyford, Kirriemuir, for a Report of Experiments with Soluble and Insoluble Phosphates,	5	0	0
8.	John Mackie, Upper Bandeath, Stirling, for a Report on the Reclamation of Land from Moss, Medium Gold Medal.	6	2	0
9.	James Cowie, Sundridge Hall, Bromley, Kent, for designing Plans of Farm Buildings, Medium Gold Medal	6	2	0
10.	Bowes A. Paice, Architect, 9 George Street, Hanover Square, London, for Drawing Plans of Farm Buildings, Medium Gold Medal	6	2	0
11.	James Wedderspoon, Netherhall Estate Office, Maryport, for Plans of Farm Buildings, Minor Gold Medal	3	15	0
12.	Richard Brown, C.A., 29 St Andrew Square, Edinburgh, for a Report on Farm Bookkeeping, Plate.	3	0	0

FORESTRY.

13.	George Grant Mackay of Glengloy, Kingussie, for a Report on Plantations on the Estate of Glengloy, Plate.	10	0	0
14.	Robert Hutchison of Carlowrie, Kirkliston, for a Report on Old and Remarkable Sycamores,	10	0	0
15.	Robert Hutchison of Carlowrie, Kirkliston, for a Report on Old and Remarkable Ashes,	10	0	0
16.	Robert Hutchison of Carlowrie, Kirkliston, for a Report on the *Abies Albertiana*,	5	0	0
17.	Robert Hutchison of Carlowrie, Kirkliston, for a Report on the Effects of the severe Winter of 1878–79 on Trees and Shrubs,	5	0	0
18.	Thomas Wilkie, Ardkinglas, Inveraray, for a Report on the Replanting of Woodlands,	3	0	0
		£154	1	0

II.—DUMFRIES SHOW, 1878.

John G. Rollins & Co., Old Swan Wharf, London Bridge, London, E.C., for American Grain Drill (at trial at Niddrie Mains, 13th November 1878), Medium Gold Medal.	£6	2	0
G. W. Murray & Co., Banff, for Potato Planter (at trial at Niddrie Mains, 28th March 1879),	5	0	0
Thomas Hunter, Maybole, for Single Drill Turnip Raiser (at trial at Niddrie Mains, 14th November 1878), Minor Gold Medal.	3	15	0
	£14	17	0

III.—PERTH SHOW, 1879.

Class I.—CATTLE.

SHORTHORN.

Tweeddale Gold Medal.—Best SHORTHORN Animal in the Yard.

Lord Rathdonnell, Lisnavagh, Tullow, co. Carlow, Ireland, "Anchor" (32,947) . £21 0 0

Section 1. BULLS calved before 1st January 1877.

1. Lord Rathdonnell, Lisnavagh, Tullow, co. Carlow, Ireland, "Anchor" (32,947) . 25 0 0
2. Thomas Willis, jun., Manor House, Carperby, Bedale, "Rear-Admiral" (37,310) 15 0 0
3. James Bruce, Burnside, Fochabers, "Knickerbocker" (38,510) . . 10 0 0

Breeder of Best Bull—Richard Chaloner, Kingsfort, Moynalty, co. Meath, Ireland, ... Silver Medal, 0 16 0

Very Highly Commended, James Bruce, Burnside, Fochabers, "Earl of March" (33,807); Highly Commended, William A. Mitchell, Auchnagathel, Whitehouse, Aberdeen, "Duke of Chamburgh" (36,052); Commended, James Walls, Lochran, Kinross, "Pretender" (35,067).

Section 2. BULLS calved after 1st January 1877.

1. Lord Polwarth, Broomhall, Mertoun, St Boswells, "Warrior Brave," . . 25 0 0
2. Charles Stirling Home Drummond Moray of Abercairny, Crieff, "Prince Alfred," 15 0 0
3. Walter Scott, Glendronach, Huntly, "Cossack" (39,633), . . . 10 0 0

V. H. C., Henry Scrymgeour Wedderburn of Wedderburn, Birkhill, Cupar-Fife, "Breastplate" (40,102); H. C., William Handley, Greenhead, Milnthorpe, Westmoreland, "Master Harbinger" (40,324); C., William Handley, Greenhead, Milnthorpe, Westmoreland, "Lord St Vincent" (40,239).

Section 3. BULLS calved after 1st January 1878.

1. James M'William, Stoneytown, Keith, "Favourite," 15 0 0
2. James Nicholson, Murton, Berwick-upon-Tweed, "Harold," . . . 10 0 0
3. David C. Bruce, Broadland, Huntly, "Earl of Moray," . . . 5 0 0

H. C., James A. Gordon, Udale, Invergordon, "Rosario 2d."

Section 4. COWS of any Age.

1. The Earl of Tankerville, Chillingham Castle, Alnwick, "Gaiety 3d," . . 20 0 0
2. Her Majesty the Queen, The Prince Consort's Shaw Farm, Windsor, "Cawlina 5th," 10 0 0
3. The Duke of Richmond and Gordon, K.G., Gordon Castle, Fochabers, "Chief Lustre 22d," 5 0 0

V. H. C., Major Ramsay of Barra, Straloch, Aberdeen, "Young Roan Lady." H. C., James Bruce, Burnside, Fochabers, "Lady Clara 2d;" H. C., James Currie, Halkerston, Gorebridge, "Rose of Tralee;" C., George Ashby Ashby, Naseby Woolleys, Rugby, "Innocence;" James Currie, Halkerston, Gorebridge, "Cherry Princess;" James A. Gordon, Udale, Invergordon, "Undine 13th;" William Langhorn, East Mill Hills, Haydon Bridge, "Diadem 2d;" Walter Scott, Glendronach, Huntly, "Zarina."

Section 5. HEIFERS calved after 1st January 1877.

1. James Whyte, Aldbro, Darlington, "Stanwick Rose," . . . 15 0 0
2. Thomas Lambert, Elrington Hall, Haydon Bridge, "Princess Louise," . . 10 0 0
3. Her Majesty the Queen, The Prince Consort's Shaw Farm, Windsor, "Cawlina 9th," 5 0 0

V. H. C., Major Ramsay of Barra, Straloch, Aberdeen, "Matilda 2d." H. C., Charles A. Cantlie, Keithmore, Dufftown, "Myrtle 29th." C., The Hon. George Waldegrave Leslie, Leslie House, Leslie," Rose of Deuchrie."

Section 6. HEIFERS calved after 1st January 1878.

1. James White, Aldbro, Darlington, "Gaiety 6th," 10 0 0
2. Evan Baillie of Dochfour, Inverness, "Sweet Pea," 8 0 0
3. James Bruce, Burnside, Fochabers, "Jenny Lind 8th," . . . 4 0 0

V. H. C., Evan Baillie, of Dochfour, Inverness, "Golden Lace." H. C., James Bruce, Burnside, Fochabers, "Marigold 4th." C., Major Ramsay, of Barra, Straloch, Aberdeen, "Matilda 3d."

Carry forward. £228 16 0

Brought forward, £238 16 0

POLLED ANGUS OR ABERDEEN.

Section 7. BULLS calved before 1st January 1877.

1. The Marquis of Huntly, Aboyne Castle, Aberdeenshire, "Monarch" (1182), . 20 0 0
2. William James Taylor, Rothiemay House, Huntly, "Sir Maurice" (1319), . 10 0 0
3. Sir George Macpherson Grant, Bart., Ballindalloch Castle, Ballindalloch, "Judge," (1150), ... 5 0 0

Breeder of Best Bull—The Marquis of Huntly, . . . Silver Medal, 0 16 0

V. H. C., The Earl of Strathmore, Glamis Castle, Forfar, "Sir Wilfred" (1157).
H. C., Thomas Smith, Powrie, Dundee, "Norman of Powrie" (1257).

Section 8. BULLS calved after 1st January 1877.

1. Robert Anderson, Daugh, Tarland, Aberdeen, "Prince Albert of Baads" (1336), ... 20 0 0
2. William M. Skinner, Drumin, Ballindalloch, "Comet" (1411), . . . 10 0 0
3. George Hamilton, Skene House, Aberdeen, "His Excellency" (1271), . . 5 0 0

V. H. C., T. L. M. Cartwright, Melville House, Ladybank, "Black Prince" (1244).
H. C., Sir George Macpherson Grant, Bart., Ballindalloch Castle, Ballindalloch, "Editor" (1460).

Section 9. BULLS calved after 1st January 1878.

1. Sir George Macpherson Grant, Bart., Ballindalloch Castle, Ballindalloch, "Justice" (1462), ... 10 0 0
2. The Earl of Airlie, K.T., Cortachy Castle, Kirriemuir, "Pontiff" (1497), . 5 0 0
3. William M'Combie of Easter Skene, Skene, Aberdeen, "Gustavus" (1537), . 3 0 0

V. H. C., John Hannay, Gavenwood, Banff, "Earl Volhr" (1449). H. C., George Reid, Baads, Peterculter, "Juryman 2d" (1591).

Section 10. COWS of any age.

1. John Hannay, Gavenwood, Banff, "Blackbird of Corskie 2d" (3024), . . 20 0 0
2. William M. Skinner, Drumin, Ballindalloch, "Sunshine 2d" (3333), . . 10 0 0
3. Henry D. Adamson, Balquharn, Alford, Aberdeen, "Sybil 2d of Tillyfour" (3526), ... 5 0 0

V. H. C., Sir George Macpherson Grant, Bart., Ballindalloch Castle, Ballindalloch, "Eva" (984). H. C., The Marquis of Huntly, Aboyne Castle, Aberdeenshire, "Madge of Portlethen" (1217).

Section 11. HEIFERS calved after 1st January 1877.

1. Sir George Macpherson Grant, Bart., Ballindalloch Castle, Ballindalloch, "Birthday" (3373), ... 10 0 0
2. John Hannay, Gavenwood, Banff, "Corriemulzie 2d" (3415), . . . 6 0 0
3. William James Tayler, Rothiemay House, Huntly, "Kate Darling" (3573), . 4 0 0

V. H. C., John Hannay, Gavenwood, Banff, "Kate of Glenbarry 4th" (3512).
H. C., William M'Combie of Easter Skene, Skene, Aberdeen, "Lorna" (3770).

Section 12. HEIFERS calved after 1st January 1878.

1. William M. Skinner, Drumin, Ballindalloch, "Gaiety 3d" (3983), . . 8 0 0
2. The Earl of Airlie, K.T., Cortachie Castle, Kirriemuir, "Pavilion" (3772), . 5 0 0
3. The Earl of Strathmore, Glamis Castle, Forfar, "Queen Mary 1st of Glamis" (3312), ... 3 0 0

V. H. C., John Hannay, Gavenwood, Banff, "Aunt Lee." H. C., Henry D. Adamson, Balquharn, Alford, Aberdeen, "Pride of Aberdeen 18th." C., James Moir, Mains of Wardhouse, Insch, "Duchess of Clova 4th" (4032).

GALLOWAY.

Section 13. BULLS calved before 1st January 1877.

1. James Little, Fauld, Longtown, "Lord Walter of Drumlanrig" (1024), . . 20 0 0
2. James Little, Fauld, Longtown, "Liddesdale" (1031), ... 10 0 0
3. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, Thornhill, "Sir William of Drumlanrig" (1039), ... 5 0 0

Breeder of Best Bull—The Duke of Buccleuch, K.G., . . Silver Medal, 0 16 0

Carry forward, £414 8 0

	Brought forward,	£434	8 0

SECTION 14. BULLS calved after 1st January 1877.

1. James Cunningham, Tarbreoch, Dalbeattie, "Knowsley" (1279),		20	0 0
2. James Graham, Parcelstown, Longtown, "Harden" (1151),		10	0 0

SECTION 15. BULLS calved after 1st January 1878.

1. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Stanley" (1348),		10	0 0
2. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Buccleuch" (1342),		5	0 0
3. James Cunningham, Tarbreoch, Dalbeattie, "Clarendon" (1350),		3	0 0

SECTION 16. COWS of any age.

1. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Fanny 2d of Drumlanrig" (2623),		20	0 0
2. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Hannah 3d of Drumlanrig" (2620),		10	0 0
3. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Lady Stanley of Drumlanrig" (2858),		5	0 0
H. C., The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Melantho of Drumlanrig" (1643). C., James Cunningham, Tarbreoch, Dalbeattie, "Jeannie Deans" (2696).			

SECTION 17. HEIFERS calved after 1st January 1877.

1. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Alice 3d of Drumlanrig" (2986),		10	0 0
2. W. & J. Shennan, Balig, Kirkcudbright, "Miller 8th,"		6	0 0
3. W. & J. Shennan, Balig, Kirkcudbright, "Mary of Balig 4th,"		4	0 0
H. C., The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Harriet 9th of Drumlanrig" (2980). C., The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Princess 2d of Drumlanrig" (2990).			

SECTION 18. HEIFERS calved after 1st January 1878.

1. W. & J. Shennan, Balig, Kirkcudbright, "Jenny Duke,"		8	0 0
2. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Helena of Drumlanrig" (3412),		5	0 0
3. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Britomartis 2d of Drumlanrig" (3420),		3	0 0
H. C., The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Nundina 2d of Drumlanrig" (3414). C., James Cunningham, Tarbreoch, Dalbeattie, "Jeannie Deans 2d of Tarbreoch" (3599).			

AYRSHIRE.

SECTION 19. BULLS calved before 1st January 1877.

1. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Morning Star" (43),		20	0 0
2. John Young, Cobblebrae, Falkirk, "King Carthus,"		10	0 0
3. Robert Buchanan, Blairquosh, Strathblane, "Baldy,"		5	0 0
Breeder of Best Bull—William Hunter, Craighead, Abington,	Silver Medal,	0	16 0

SECTION 20. BULLS calved after 1st January 1877.

1. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Lord of the Isles."		20	0 0
2. Robert Wilson, Forehouse, Kilbarchan, "Sir Garnet."		10	0 0
3. Robert Wardrop, Garlaff, Old Cumnock, "Wattieston Prince,"		5	0 0
V. H. C., Sir Michael R. Shaw Stewart of Ardgowan, Bart., Greenock, "Beaconsfield." H. C., Duncan Keir, Buchlyvie, "Buchlyvie." C., Duncan Keir, Buchlyvie, "Rob."			
	Carry forward.	£624	4 0

Brought forward,	£621	4	0

SECTION 21. BULLS calved after 1st January 1878.

1. James Weir, Sandilands, Lanark, "Stanley,"	10	0	0
2. The Duke of Buccleuch and Queensberry, K.G., "Scottish Chief."	5	0	0
3. Andrew M'Dowall, Auchtralure, Stranraer, "Sir Garnet."	3	0	0

V. H. C., Alexander Craig, Over Milton, East Kilbride, "Duncan." H. C., Duncan Keir, Buchlyvie, "Baron." C., Robert Wardrop, Garlaff, Old Cumnock, "Young Evermore."

SECTION 22. COWS in Milk, of any age.

1. The Duke of Buccleuch and Queensberry, K.G., "White Rose of Drumlanrig,"	20	0	0
2. The Duke of Buccleuch and Queensberry, K.G., "Countess 5th of Drumlanrig" (108),	10	0	0
3. The Duke of Buccleuch and Queensberry, K.G., "Cherry 2d of Drumlanrig" (96),	5	0	0

V. H. C., Robert Wilson, Forehouse, Kilbarchan, "Jess." H. C., Andrew Leiper, Yard Bent, Strathaven, "Marjory." C., James Pettigrew, Cairnhill House, Airdrie, "Fanny."

SECTION 23. COWS in Calf, of any age, or HEIFERS in Calf, calved before 1st January 1877.

1. The Duke of Buccleuch and Queensberry, K.G., "Snowflake of Drumlanrig,"	15	0	0
2. The Duke of Buccleuch and Queensberry, K.G., "Hilda of Drumlanrig,"	10	0	0
3. William Howie, Finnockbog, Inverkip, "Dandy,"	5	0	0

C., The Earl of Mansfield, K.T., Scone Palace, Perth, "Snowdrop,"

SECTION 24. HEIFERS calved after 1st January 1877.

1. The Duke of Buccleuch and Queensberry, K.G., "Belle of Drumlanrig,"	10	0	0
2. James Scott, Newlands, Uddingston, "Pride of Bothwell,"	6	0	0
3. The Duke of Buccleuch and Queensberry, K.G., "Evelyn of Drumlanrig,"	4	0	0

V. H. C., The Duke of Buccleuch and Queensberry, K.G., "Bessie of Drumlanrig." H. C., The Duke of Buccleuch and Queensberry, K.G., "Adela of Drumlanrig."

SECTION 25. HEIFERS calved after 1st January 1878.

1. The Duke of Buccleuch and Queensberry, K.G., "Eva of Drumlanrig,"	8	0	0
2. Andrew M'Dowall, Auchtralure, Stranraer, "Jenny Lind,"	5	0	0
3. James Williamson, Greenhead, Wishaw, "Jessie,"	3	0	0

V. H. C., The Duke of Buccleuch and Queensberry, K.G., "Alma of Drumlanrig." H. C., Robert Wilson, Forehouse, Kilbarchan. C., The Duke of Buccleuch and Queensberry, K.G., "Bell of Drumlanrig."

HIGHLAND.

SECTION 26. BULLS calved before 1st January 1876.

1. The Duke of Athole, K.T., Blair Castle, Blair Athole, "Calum Riabhach,"	20	0	0
2. James Duncan of Benmore, "Donnachadh Ban,"	10	0	0
3. The Earl of Breadalbane, Taymouth Castle, Aberfeldy, "Roanull,"	5	0	0
Breeder of Best Bull—The Duke of Athole, K.T., Silver Medal,	0	16	0

H. C., The Hon. the Master of Blantyre, Lairg, "Quirang." C., The Earl of Seafield, Castle Grant, Grantown, "Rory"

SECTION 27. BULLS calved after 1st January 1876.

1. John Stewart, Duntulm, Portree, "Prionnsa Tearlach,"	20	0	0
2. Alex. M'Donald, Nether Lergie, Kilmartin, "Brockreach 2d"	10	0	0
3. John M'Gillivray, Ballachroan, Kingussie, "Crinan 3d,"	5	0	0

H. C., W. H. Marshall of Callander, "Reanuighe Gleannach"

SECTION 28. BULLS calved after 1st January 1877.

1. John Stewart, Bochastle, Callander, "Gille Buidhe"	10	0	0
2. Lord Kinnaird, Rossie Priory, Inchture, "Gille Odhar"	5	0	0
3. The Duke of Athole, K. T., Blair Castle, Blair Athole, "Ailpean"	3	0	0

V. H. C., John Stewart, Bochastle, Callander, "Roderick Dubh 2d." H. C., The Earl of Breadalbane, Taymouth Castle, Aberfeldy, "Charlie." C., John Mackintosh, South Kinrara, Aviemore, "Donald Dinnie."

Carry forward,	£	s	d

Brought forward. £832 0

SECTION 29. COWS of any age.

1. James Duncan of Benmore, Kilmun, Greenock, "Phroiseag 2d," . . 20 0 0
2. The Earl of Breadalbane, Taymouth Castle, Aberfeldy, "Christina," . . 10 0 0
3. The Earl of Seafield, Castle Grant, Grantown, "Bynach," . . . 5 0 0

V. H. C., John Stewart, Bochastle, Callander, "Mhaighdean Bhuide." H. C., John Stewart, Duntulm, Portree, "Targheal." C., The Duke of Athole, K.T., Blair Castle, Blair Athole, "N'Uallach."

SECTION 30. HEIFERS calved after 1st January 1876.

1. The Duke of Athole, K.T., Blair Castle, Blair Athole, "Te Riabhach," . . 10 0 0
2. John Stewart, Duntulm, Portree, "Ribhinn Lurach," 6 0 0
3. John Stewart, Bochastle, Callander, "Nannie Odhar," 4 0 0

V. H. C., The Duke of Athole, K.T., Blair Castle, Blair Athole, "Bean Og." H. C., John Mackintosh, South Kinrara, Aviemore, "Duchess." C., John Stewart, Bochastle, Callander, "Mairi Og."

SECTION 31. HEIFERS calved after 1st January 1877.

1 John Stewart, Duntulm, Portree, "Guanach," 8 0 0
2. The Earl of Breadalbane, Taymouth Castle, Aberfeldy, "Flora," . . 5 0 0
3. John Stewart, Bochastle, Callander, "Dubh Chruinn," 3 0 0

V. H. C., The Duke of Athole, K.T., Blair Castle, Blair Athole, "Carnag." H. C., The Earl of Seafield, Castle Grant, Grantown, "Muchrach." C., The Earl of Breadalbane, Taymouth Castle, Aberfeldy, "Lili Og"

FAT STOCK.

SECTION 32. HIGHLAND OXEN calved after 1st January 1875.

1. C. S. H. Drummond Moray of Blairdrummond, Stirling, . . . 6 0 0
2. Sir Alexander Muir Mackenzie of Delvine, Bart., Dunkeld, "Black Jock," . 3 0 0

C., The Earl of Seafield, Castle Grant, Grantown, "Geordie."

SECTION 33. HIGHLAND OXEN calved after 1st January 1876.

1. Charles Stirling Home Drummond Moray of Abercairny, Crieff, . . 5 0 0
2. C. S. H. Drummond Moray of Blairdrummond, Stirling 2 0 0

C., C. S. H. Drummond Moray of Blairdrummond, Stirling, "Alasdair;" The Earl of Seafield, Castle Grant.

SECTION 34. POLLED OXEN calved after 1st January 1876.

1. William M'Combie, of Easter Skene, Skene, Aberdeen, "Jemmy," . 6 0 0
2. William M'Combie of Easter Skene, Skene, Aberdeen, "Black Bob," . . 3 0 0

H. C., John M'Dougall, Goodlyburn, Perth, "Willie."

SECTION 35. POLLED OXEN calved after 1st January, 1877.

1. Charles Lyall, Old Montrose, Montrose. 5 0 0
2. Thomas Roy, Ballendrick, Bridge of Earn, ... 2 0 0

C. Thomas Roy, Ballendrick, Bridge of Earn.

SECTION 36. OXEN of any Pure or Cross Breed calved after 1st January 1876.

1. William Peterkin, Dunglass, Dingwall, ... 6 0 0
2. John Wallace, Banbeath, Leven, ... 3 0 0

C. The Earl of Mansfield, K.T., Scone Palace.

SECTION 37. OXEN of any other Pure or Cross Breed calved after 1st January 1877.

1. Mrs. M'William, Bucharn, Huntly, ... 5 0 0
2. Do. do. 2 0 0

C., Robert Barclay, North Ballo, Coupar-Angus.

Carry forward, £951 0 0

Brought forward,	£951	0	0

SECTION 38. CROSS-BRED HEIFERS calved after 1st January 1876.

1. James Merson, Craigwillie, Huntly,	6	0	0
2. William Drysdale of Kilrie, Kinghorn,	3	0	0

C., The Earl of Mansfield, K.T., Scone Palace.

SECTION 39. CROSS-BRED HEIFERS calved after 1st January 1877.

1. William Drysdale of Kilrie, Kinghorn,	5	0	0
2. James Merson, Craigwillie, Huntly,	2	0	0

C., Charles H. Dundas, Gerrichrew, Crieff.

EXTRA CATTLE.

Very Highly Commended

Polled Angus Bull, "Shah," winner of First Prize at Dumfries, 1878, Thomas Ferguson, Kinnochtry, Coupar-Angus,	5	0	0
Highland Heifer, "Dulnain," The Earl of Seafield, Castle Grant, Grantown, Medium Gold Medal,	6	2	0
Highland Heifer, "Brora," The Hon. the Master of Blantyre, Colloboll, Lairg, Medium Gold Medal,	6	2	0
Indian Cow with Calf at foot, Sir John W. P. Orde of Kilmory, Bart.,	5	0	0

Highly Commended.

American Shorthorn Ox, John Bell & Sons, 170 Argyle Street, Glasgow,	3	0	0
Alderney Cow, "Daisy," H. W. Pople, British Hotel, Perth,	3	0	0
Guernsey Bull, "Napoleon," The Earl of Breadalbane, Taymouth Castle, Aberfeldy, Minor Gold Medal,	3	15	0
Indian Bull, Sir John W. P. Orde of Kilmory, Bart.,	3	0	0

Commended.

White Highland Cow with Calf at foot, Sir John W. P. Orde of Kilmory, Bart., Lochgilphead, Silver Medal,	0	16	0
White Highland Cow with Calf at foot, Sir John W. P. Orde of Kilmory, Bart., Lochgilphead, Silver Medal,	0	16	0
	£1003	11	0

CLASS II.—HORSES

FOR AGRICULTURAL PURPOSES.

STALLION TO TRAVEL THE DISTRICT OF THE PERTH SHOW IN SEASON 1879.

David Riddell, Blackhall, Paisley, "Luck's All" (510),	150	0	0

BEST STALLION for Agricultural purposes.

David Riddell, Blackhall, Paisley, "Luck's All" (510), Silver Cup,	£25	0	0

BEST MARE for Agricultural Purposes.

John M. Martin, Auchendennan Farm, Balloch, "Damsel." Silver Cup,	25	0	0

SECTION 1. STALLIONS foaled before 1st January 1876.

1. David Riddell, Blackhall, Paisley, "Luck's All" (510),	40	0	0
2. David Buchanan, Garscadden Mains, New Kilpatrick, "Druid,"	30	0	0
3. David Riddell, Blackhall, Paisley, "The Bonnie Breast Knot,"	20	0	0
4. Peter Crawford, Dumgoyack, Strathblane, "Strathclyde,"	10	0	0
Breeder of Best Stallion—Lawrence Drew, Merryton, Hamilton, Silver Medal,	0	16	0

V. H. C., William Miller, Pond Cottage, Whitehouse, Aberdeen, "Boydston Boy" (111). H. C., John Macdonald, Porterfield, Renfrew, "Pride of Renfrew." C., John Hendrie of Larbert, Stirlingshire, "General Neil."

SECTION 2. ENTIRE COLTS foaled after 1st January 1876.

1. David Riddell, Blackhall, Paisley, "Roseberry,"	30	0	0
2. James M'Nab, Glenochil House, Menstrie, "Champion of the North,"	20	0	0
3. Matthew Dunlop, Tannoch, Cumbernauld, "Royal Prince,"	10	0	0
4. William Ironside, Clofrickford, Ellon, "Baron Knight,"	5	0	0

V. H. C., David Riddell, Blackhall, Paisley, "Brilliant." H. C., Robert Duncan, Brockwellmuir, Dunlop, Ayrshire, "Pride of Dunlop," C., James Park, Dechmont, Cambuslang, "Wait on Me."

Carry forward,	£1,284	16	0

	Brought forward,	£365	16 0

SECTION 3. ENTIRE COLTS foaled after 1st January 1877.

1.	Peter Crawford, Dumgoyack, Strathblane, "Craichmore Bob,"	20	0 0
2.	David Riddell, Blackhall, Paisley,	14	0 0
3.	Robert Pollock, Green, Newton Mearns, "Lord Colin Campbell,"	7	0 0
4.	Lord Polworth, Mertoun, St. Boswells, "Pride o' Dee,"	4	0 0

V. H. C., John Morrison, Hattonslap, Old Meldrum, "Congress." H. C., Peter Crawford, Dumgoyack, Strathblane, "Kintyre." C., Thomas Lindsay, Townend, Craigie, "Gladstone."

SECTION 4. ENTIRE COLTS foaled after 1st January 1878.

1.	James Johnstone, Lochburnie, Maryhill, "Lord Douglas,"	15	0 0
2.	David Riddell, Blackhall, Paisley,	8	0 0
3.	Alexander Brackenridge, Stevenston Mains, Holytown, "Sir Michael,"	4	0 0
4.	Peter Sim, Mains of Powfowlis, Falkirk, "Lyon of the Lyons,"	2	0 0

V. H. C., Andrew M'Dowall, Auchtralure, Stranraer, "Sir Garnet." H. C., John Macdonald, Porterfield, Renfrew, "Cetewayo." C., David Riddell, Blackhall, Paisley.

SECTION 5. MARES (with Foal at foot) foaled before 1st January 1876.

1.	James Picken, Laigh Langside, Craigie, Kilmarnock, "Young Darling,"	30	0 0
2.	James Gourlie, Westfarm, Tollcross, "Rosie,"	20	0 0
3.	James Blyth, Leckiebank, Auchtermuchty, "Comely,"	15	0 0
4.	James Scott, St. Mary's, Orton, Fochabers, "Polly,"	6	0 0

H. C., Sir Thomas Gladstone of Fasque, Bart., Laurencekirk, "Ailsie."

SECTION 6. MARES (in Foal) foaled before 1st January 1876.

1.	John M. Martin, Auchendennan Farm, Balloch, "Damsel,"	25	0 0
2.	Robert Loder, Whittlebury, Towcester, "Jess,"	15	0 0
3.	John Waddell of Inch, Bathgate, "Countess,"	10	0 0
4.	John Harvie, Langton, Newton Mearns, Langton Lass,"	5	0 0

V. H. C., James Cunningham, Tarbreoch, Dalbeattie, "Jean." H. C., William Brock, Barns of Clyde, Yoker, "Lily." C., Thomas Muirhead, Crookedstone, Hamilton, "Young Jessie."

SECTION 7. FILLIES foaled after 1st January 1876.

1.	John M. Martin, Auchendennan Farm, Balloch, "Effie Deans,"	20	0 0
2.	Robert Murdoch, Hallside, Newton, Glasgow, "Adela,"	10	0 0
3.	James Hunter, Coplawhill, Strathbungo, Glasgow, "Jeannie,"	5	0 0
4.	David Wilkie, Linbank, Dollar, "Jess,"	3	0 0

V. H. C., Robert Loder, Whitlebury, Towcester, "Lovely 2d." H.C., David Riddell, Blackhall, Paisley. C., James M'Nab, Glenochill House, Menstrie, "Nelly."

SECTION 8. FILLIES foaled after 1st January 1877.

1.	Robert Pollock, Green Farm, Newton Mearns, "Darling,"	15	0 0
2.	Andrew M'Dowall, Auchtralure, Stranraer, "May Belle,"	8	0 0
3.	David Riddell, Blackhall, Paisley,	4	0 0
4.	John M. Martin, Auchendennan Farm, Balloch, "Dolly Dutton,"	2	0 0

V. H. C., David Buchanan, Garscadden Mains, New Kilpatrick, "May Qneen." H. C., Archibald M'Vicar, Woodend, Bathgate, "Darling." C., John Waddell of Inch, Bathgate, "Louisa."

SECTION 9. FILLIES foaled after 1st January 1878.

1.	John M. Martin, Auchendennan Farm, Balloch, "Annot Lyle,"	10	0 0
2.	Archibald M'Vicar, Woodend, Bathgate, "Princess,"	5	0 0
3.	David Cross of Knockdon, Maybole, "Young Hawkie,"	3	0 0
4.	John Hendrie of Larbert, Stirlingshire, "Dahlia,"	2	0 0

V. H. C., The Earl of Strathmore, Glamis Castle, Forfar, "Victoria." H. C., James M'Nab, Glenochill House, Menstrie, "Lucy." C., James Park, Dechmont, Cambuslang.

	Carry forward,	£652	16 0

Brought Forward.	£652	16	0

SECTION 10. DRAUGHT GELDINGS foaled before 1st January 1876.

1. John Letham, East Mains, Stonehouse, "Jolly,"	10	0	0
2. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Lofty,"	5	0	0
3. John Waddell of Inch, Bathgate, "Charmer,"	3	0	0

SECTION 11. DRAUGHT GELDINGS foaled after 1st January 1876.

1. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, "Blythe,"	8	0	0
2. Sir Michael R. Shaw Stewart of Ardgowan, Bart., Greenock, "Jamie,"	4	0	0
3. David Buttar, South Corston, Coupar-Angus, "Jim,"	2	0	0

HUNTERS AND ROADSTERS.

SECTION 12. BROOD MARES, with Foal at foot, suitable for field.

1. John Whyte, Lundin Mill, Largo, "Myrtle,"	20	0	0
2. Robert Williams, The Green, Wishaw, "Merry Lass,"	10	0	0
3. James Thom, Leden Urquhart, Strathmiglo, "Vernal,"	5	0	0

V. H. C., Robert Stark, Kirkcaldy, "Fanny Wyne." H. C., Andrew Crawford, Pitlowie, Glencarse, Perth, "Miss." C., Robert Stark, Kirkcaldy, "Lady Baillie."

SECTION 13. MARES or GELDINGS suitable for field, foaled before 1st January 1875.

1. John Hendrie of Larbert, Stirlingshire, Gelding, "Dundee,"	20	0	0
2. H. V. Haig, Cameronbridge, Windygates, Mare, "Pat de Chat,"	10	0	0
3. C. A. Murray, Taymount, Stanley, Perth, Mare, "Bessie,"	5	0	0

V. H. C., J. C. Cunninghame, Craigends House, Johnstone, Gelding, "Wellington." H. C., William W. Anderson, Norton Mains, Rathe, Gelding, "Clouner." C., James Macqueen, Salutation Coach Office, Perth, Mare, "The Fair Maid of Perth."

SECTION 14. MARES or GELDINGS suitable for field, foaled after 1st January 1875.

1. Edward Lawson, Howrigg, Thursby, Carlisle, Gelding, "Major,"	15	0	0
2. Andrew Crawford, Pitlowie, Glencarse, Perth, Gelding, "Rattler,"	8	0	0
3. David S. Ireland, Argyle Brewery, St. Andrews, Mare, "Gipsy,"	4	0	0

V. H. C., John Mark, Craigend, Stow, Gelding, "Border Chief." H. C., David S. Ireland, Argyle Brewery, St. Andrews, Mare, "Jessie." C., J. B. Stephenson, Forteviot, Perth, Gelding, "Salisbury."

SECTION 15. MARES or GELDINGS suitable as hackneys or roadsters, between 14 and 15 hands high.

1. Commander G. D. Clayhills Henderson, R.N., Invergowrie, Dundee, Gelding, "Mr Arthur,"	8	0	0
2. Francis Gibson, Woolmet, Dalkeith, Gelding, "Punch,"	4	0	0
3. David Stratton, 13 Middleby Street, Edinburgh, Mare, "Maggie."	2	0	0

V. H. C., James Small of Dirnanean, Pitlochry, Mare, "Alma." H. C., John M'Dougall, Goodlyburn, Mare, "Cherry." C., James E. Ross, Abercairny Cottage, Crieff, Gelding, "Paddy."

SECTION 16. STALLIONS, MARES, or GELDINGS for Leaping.

1. James Thom, Leden Urquhart, Strathmiglo, Mare, "Countess,"	10	0	0
2. James Macqueen, Salutation Coach Office, Perth, Mare, "The Fair Maid of Perth."	5	0	0

PONIES.

SECTION 17. HIGHLAND STALLIONS, 14½ hands high and under.

1. D. M'L. MacLeod, Coulmore, Inverness, "Glen,"	6	0	0
2. The Duke of Athole, K.T., Blair Castle, "Young Glengarry,"	3	0	0
Carry forward.	£819	16	0

	Brought forward,	£819	16 0

SECTION 18. HIGHLAND MARES or GELDINGS between 13 and 14½ hands high.

1.	James Menzies, Coshieville, Aberfeldy, Mare, "Jean,"	6	0 0
2.	D. D. M'L. MacLeod, Coulmore, Inverness, Gelding, "Blacky,"	3	0 0

SECTION 19. MARES or GELDINGS between 12½ and 14 hands high.

1.	David Carnegie of Stronvar, Lochearnhead, Gelding, "Max,"	6	0 0
2.	Sir James R. Gibson Maitland, Bart., Craigend House, Stirling, Mare, "Silverlocks,"	3	0 0
3.	Andrew Ralston, Glamis House, Gelding, "The Khedive,"	1	0 0
V. H. C., David Stratton, 13 Middleby Street, Edinburgh, Mare, "Kate." H. C., W. S Ferguson, Friarton Works, Perth, Gelding, "Donald." C., Robert Stark, Kirkcaldy, Mare, "Barbara."			

SECTION 20. MARES or GELDINGS under 12½ hands high.

1	Thomas Roy, Ballendrick, Bridge of Earn, Mare, "Maggie,"	6	0 0
2.	George Knox, Nether Malletsheugh, Newton Mearns. Mare, "Trottums,"	3	0 0
3.	Mrs Scrymgeour Wedderburn of Wedderburn, Birkhill, Cupar-Fife, Mare, "Jenny,"	1	0 0
V. H. C., Thomas Roy, Ballendrick, Bridge of Earn, Mare, "Dora." H. C., Col. W. Macdonald Macdonald of St Martins, Perth, Mare, "Virginia." C., Mrs Scrymgeour Wedderburn of Wedderburn, Birkhill, Cupar-Fife, Gelding, "Jack."			

EXTRA HORSES.

Very Highly Commended.

Thorough-bred Gelding, "Sir Walter," Sir Alex. Muir Mackenzie of Delvine, Bart., Dunkeld,		5	0 0
Thorough-bred Mare, "Sheila," Sir Alex. Muir Mackenzie of Delvine, Bart., Dunkeld,		5	0 0
Highland Pony Stallion, "Glengarry," John C. Cameron of Garrows, Dunkeld,		5	0 0
Thorough-bred Entire Colt, "Athole Lad," F. N. Menzies, Balmacneil, Ballinluig,		5	0 0

Highly Commended.

Highland Pony Gelding, "Donald," Jas. Macduff, Newmill, Stanley,		3	0 0
		£871	16 0

CLASS III.—SHEEP.

BLACKFACED.

SECTION 1. TUPS, 3 Shear and upwards.

1.	David Foyer, Knowehead, Campsie,	£8	0 0
2.	James M'Kersie, East Glenbuck, Muirkirk,	4	0 0
3.	John Fleming, Ploughland, Strathaven,	2	0 0
V. H. C., Charles Howatson of Dornel and Glenbuck, Mauchline. H. C., James M'Kersie, East Glenbuck, Muirkirk. C., James Duncan of Benmore, Blairmore, Greenock.			

SECTION 2. TUPS, 2 Shear.

1.	Charles Howatson of Dornel and Glenbuck, Mauchline,	12	0 0
2.	Charles Howatson of Dornel and Glenbuck, Mauchline,	8	0 0
3.	John Fleming, Ploughland, Strathaven,	4	0 0
V. H. C., David Foyer, Knowehead, Campsie. H. C., Charles Howatson of Dornel and Glenbuck, Mauchline. C., David Foyer, Knowehead, Campsie.			

SECTION 3. SHEARLING TUPS.

1	David Foyer, Knowehead, Campsie,	12	0 0
2	David Foyer, Knowehead, Campsie,	8	0 0
3.	Charles Howatson of Dornel and Glenbuck, Mauchline,	4	0 0
V. H. C., David Foyer, Knowehead, Campsie. H. C., John Fleming, Ploughland, Strathaven. C., Robert Buchanan, Letter, Killearn.			

	Carry forward.	£32	0 0

	Brought forward,	£62	0 0

SECTION 4. Pens of 5 EWES, above 1 Shear with Lambs.

1. David Foyer, Knowehead, Campsie,		10	0 0
2. Patrick Melrose, West Loch, Eddlestone,		5	0 0
3. James M'Pherson, Clunas, Nairn,		2	0 0

V. H. C., James Duncan of Benmore, Greenock.

LAMBS.

1. David Foyer, Knowehead, Campsie,		2	0 0
2. Patrick Melrose, West Loch, Eddlestone,		1	0 0

SECTION 5. Pens of 5 SHEARLING EWES or GIMMERS.

1. David Foyer, Knowehead, Campsie,		10	0 0
2. Robert Buchanan, Letter, Killearn,		5	0 0
3. William Whyte, Spott, Kirriemuir,		2	0 0

V. H. C., James G. Inch, Mitchellhill, Biggar. H. C., Patrick Melrose, West Loch, Eddlestone. C., George Warnock, Todlaw, Lesmahagow.

CHEVIOT.

SECTION 6. TUPS, 3 Shear and upwards.

1. Thomas Elliot, Hindhope, Jedburgh,		8	0 0
2. Thomas Elliot, Hindhope, Jedburgh,		4	0 0
3. Thomas Elliot, Hindhope, Jedburgh,		2	0 0

V. H. C., John A. Johnstone, Archbank, Moffat.

SECTION 7. TUPS, 2 Shear.

1. John A. Johnstone, Archbank, Moffat,		12	0 0
2. Thomas Elliot, Hindhope, Jedburgh,		8	0 0
3. John A. Johnstone, Archbank, Moffat,		4	0 0

V. H. C., John A. Johnstone, Archbank, Moffat.

SECTION 8. SHEARLING TUPS.

1. John A. Johnstone, Archbank, Moffat,		12	0 0
2. John A. Johnstone, Archbank, Moffat,		8	0 0
3. John A. Johnstone, Archbank, Moffat,		4	0 0

V. H. C, John A. Johnstone, Archbank, Moffat. H. C., Walter Mundell, Gollanfield, Fort-George Station.

SECTION 9. Pens of 5 EWES, above 1 Shear, with Lambs.

1. Thomas Elliot, Hindhope, Jedburgh,		10	0 0
2. Walter Mundell, Gollanfield, Fort-George Station,		5	0 0

LAMBS.

1. Walter Mundell, Gollanfield, Fort-George Station,		2	0 0
2. Thomas Elliot, Hindhope, Jedburgh,		1	0 0

SECTION 10. Pens of 5 SHEARLING EWES or GIMMERS.

1. Thomas Elliot, Hindhope, Jedburgh,		10	0 0
2. Thomas Elliot, Hindhope, Jedburgh,		5	0 0
3. Sir G. Graham Montgomery of Stanhope, Bart., M.P.,		2	0 0

V. H. C., Walter Mundell, Gollanfield, Fort-George Station.

BORDER LEICESTER.

SECTION 11. TUPS 3 Shear and upwards.

1. Miss Agnes Stark, Mellendean, Kelso,		8	0 0
2. James Nisbet of Lambden, Greenlaw,		4	0 0
3. Richard Tweedie, The Forest, Catterick,		2	0 0

V. H. C., William Goodlet, Bolshan, Friockheim. H. C., George Cowe, Balhousie, Carnoustie.

SECTION 12. TUPS, 2 Shear.

1. Robert Wallace, Auchenbrain, Mauchline,		12	0 0
2. Richard Tweedie, The Forest, Catterick,		8	0 0
3. Richard Tweedie, The Forest, Catterick,		4	0 0

V. H. C., John Ainslie, Hillend, Loanhead, Edinburgh. C., John Edgar, Kirkettle, Roslin.

	Carry forward,	£254	0 0

	Brought forward,	£234	0 0

SECTION 13. SHEARLING TUPS.

1. Robert Wallace, Auchenbrain, Mauchline,		12	0 0
2. John Drummond of Blackruthven, Perth,		8	0 0
3. John Drummond of Blackruthven, Perth,		4	0 0

V. H. C., Thomas Ferguson, Kinnochtry, Coupar-Angus. H. C., John Drummond of Blackruthven, Perth. C., Arthur James Balfour, M.P., of Whittinghame, Prestonkirk.

SECTION 14. Pens of 5 EWES above 1 Shear.

1. James Nisbet of Lambden, Greenlaw,		10	0 0
2. Richard Tweedie, The Forest, Catterick,		5	0 0
3. John Edgar, Kirkettle, Roslin,		2	0 0

SECTION 15. Pens of 5 SHEARLING EWES or GIMMERS.

1. Thomas Ferguson, Kinnochtry, Coupar-Angus,		10	0 0
2. Richard Tweedie, The Forest, Catterick,		5	0 0
3. Charles E Hay, Bradford House, Belford, Northumberland,		2	0 0

C., The Marquis of Tweeddale, Yester, Haddington.

LEICESTER.

SECTION 16. TUPS above 1 Shear.

1. Thomas Smith, Powrie, Dundee,		3	0 0
2. Eric Sutherland, Rosevally, Burghead,		2	0 0
3. Thomas Smith, Powrie, Dundee,		1	0 0

SECTION 17. SHEARLING TUPS.

1. Eric Sutherland, Rosevally, Burghead,		3	0 0
2. Eric Sutherland, Rosevally, Burghead,		2	0 0
3. Thomas Smith, Powrie, Dundee,		1	0 0

SECTION 18. Pens of 5 EWES above 1 Shear.

1. Eric Sutherland, Rosevally, Burghead,		3	0 0
2. Thomas Smith, Powrie, Dundee,		2	0 0
3. Thomas Smith, Powrie, Dundee,		1	0 0

SECTION 19. Pens of 5 SHEARLING EWES or GIMMERS.

1. Eric Sutherland, Rosevally, Burghead,		3	0 0
2. Thomas Smith, Powrie, Dundee,		2	0 0

COTSWOLD AND LINCOLN.

SECTION 20. TUPS above 1 Shear.—No Entry.

SECTION 21. SHEARLING TUPS.

1. Francis Gibson, Woolmet, Dalkeith (Cotswold),		3	0 0

SECTION 22. Pens of 5 EWES above 1 Shear.

1. Francis Gibson, Woolmet, Dalkeith (Cotswold),		3	0 0

SECTION 23. Pens of 5 SHEARLING EWES or GIMMERS.

1. Francis Gibson, Woolmet, Dalkeith (Cotswold),		3	0 0

SHORT WOOLLED.

SECTION 24. TUPS above 1 Shear.

1. Andrew Crawford, Pitlowie, Glencarse, Perth (Shropshire),		3	0 0
2. The Earl of Mansfield, K.T., Scone Palace, Perth (Shropshire),		2	0 0
3. The Earl of Mansfield, K.T., Scone Palace, Perth (Shropshire),		1	0 0

V. H. C., Andrew Crawford, Pitlowie, Glencarse (Shropshire). H. C., Eric Sutherland, Rosevally, Burghead (Shropshire). C., The Earl of Strathmore, Glamis Castle, Forfar (Shropshire).

	Carry forward,	£330	0 0

	Brought forward,	£330	0 0

SECTION 25. SHEARLING TUPS.

1. David Buttar, Corston, Coupar-Angus (Shropshire),		3	0 0
2. David Buttar, Corston, Coupar-Angus (Shropshire),		2	0 0
3. Andrew Crawford, Pitlowie, Glencarse, Perth (Shropshire),		1	0 0

V. H. C., Lord Polwarth, Humbie, Upper Keith (Shropshire). H. C., Francis Gibson, Woolmet, Dalkeith (Shropshire). C., Francis Gibson, Woolmet, Dalkeith (Shropshire).

SECTION 26. Pens of 5 EWES above 1 Shear.

1. Francis Gibson, Woolmet, Dalkeith (Shropshire),		3	0 0

SECTION 27. Pens of 5 SHEARLING EWES or GIMMERS.

1. The Earl of Strathmore, Glamis Castle, Forfar (Shropshire)		3	0 0
2. Francis Gibson, Woolmet, Dalkeith (Shropshire),		2	0 0
3. Andrew Crawford, Pitlowie, Glencarse, Perth (Shropshire),		1	0 0

V. H. C., The Earl of Strathmore, Glamis Castle, Forfar (Shropshire). H. C., Lord Polwarth, Humbie, Upper Keith (Shropshire). C., Andrew Crawford, Pitlowie, Glencarse, Perth (Shropshire).

EXTRA SECTIONS.

SECTION 28. Pens of 5 CHEVIOT Wethers, not above 3 Shear.—No Entry.

SECTION 29. Pens of 5 BLACKFACED WETHERS, not above 4 Shear.

1. Thomas Roy, Ballendrick, Bridge of Earn,		4	0 0
2. William Whyte, Spott, Kirriemuir,		2	0 0

SECTION 30. Pens of 5 HALF-BRED WETHER HOGGS, above 1 Shear.—No Entry.

SECTION 31. Pens of 5 HALF-BRED WETHER HOGGS, not above 1 Shear.

1. David Buttar, South Corston, Coupar-Angus,		4	0 0
2. David Buttar, South Corston, Coupar-Angus,		2	0 0

SECTION 32. Pens of 5 CROSS-BRED WETHER HOGGS, above 1 Shear.—No Entry.

SECTION 33. Pens of 5 CROSS-BRED WETHER HOGGS, not above 1 Shear.

1. John M'Dougall, Goodlyburn, Perth,		4	0 0
2. Andrew Crawford, Pitlowie, Glencarse,		2	0 0

H. C., John M'Dougall, Goodlyburn, Perth.

EXTRA SHEEP.

Very Highly Commended.

Shropshire Wether— Andrew Crawford, Pitlowie, Glencarse, Perth,		3	0 0
Five Half-Bred Wether Hoggs—Eric Sutherland, Rosevally, Burghead.		3	0 0

Highly Commended.

Five Shropshire Wether Hoggs—Andrew Crawford, Pitlowie,	Silver Medal,	0	16 0

Commended.

Four Shropshire Cross Wether Hoggs—The Earl of Mansfield, K.T., Scone Palace, Perth,	Medium Silver Medal	0	10 6
		£370	6 6

Class IV.—SWINE.

LARGE BREED.

Section 1. BOARS.

1.	R. E. Duckering, Northorpe, Kirton Lindsey,	£8	0	0

Section 2. SOWS.

1.	R. E Duckering, Northorpe, Kirton Lindsey,	6	0	0
2.	William MacDonald, Woodlands, Perth,	3	0	0
3.	Robert Wallace, Auchenbrain, Mauchline,	1	0	0

Section 3. Pens of 3 PIGS, not above 8 months old.

1.	Dr John Batty Tuke, Saughton Hall, Edinburgh,	4	0	0
2.	Robert Wallace, Auchenbrain, Mauchline,	2	0	0
3.	R. E. Duckering, Northorpe, Kirton Lindsey,	1	0	0

BLACK or BERKSHIRE.

Section 4. BOARS.

1.	R. E. Duckering, Northorpe, Kirton Lindsey,	8	0	0
2.	Sir William Forbes of Craigievar, Bart., Fintray House, Aberdeen,	4	0	0
3.	R. T. N Speir of Culdees, Muthill, Perthshire,	2	0	0

Section 5. SOWS.

1.	C. E. Duckering, Northorpe, Kirton Lindsey,	6	0	0
2.	C E. Duckering, Northorpe, Kirton Lindsey,	3	0	0
3.	Sampson Samuel Lloyd, M.P., Moor Hall, Sutton Coldfield, Birmingham,	1	0	0

Section 6. Pens of 3 PIGS, not above 8 months old.

1.	C. E. Duckering, Northorpe, Kirton Lindsey,	4	0	0
2.	C. E. Duckering, Northorpe, Kirton Lindsey,	2	0	0

SMALL BREED.

Section 7. BOARS.

1.	R. E. Duckering, Northorpe, Kirton Lindsey,	8	0	0
2.	Sir Thomas Gladstone of Fasque, Bart., Laurencekirk,	4	0	0
3.	James Duncan of Benmore, Greenock,	2	0	0

Section 8. SOWS.

1.	R. E. Duckering, Northorpe, Kirton Lindsey,	6	0	0
2.	Her Majesty the Queen, the Prince Consort's Shaw Farm, Windsor,	3	0	0
3.	Sir Thomas Gladstone of Fasque, Bart., Laurencekirk,	1	0	0

Section 9. Pens of 3 PIGS, not above 8 months old.

1.	The Earl of Tankerville, Chillingham Castle, Alnwick,	4	0	0
2.	R. E. Duckering, Northorpe, Kirton Lindsey,	2	0	0
		£85	0	0

Class V.—POULTRY.

DORKING, Silver Grey.	Cock.—1. James Rutherford, Auchtermuchty,	£1	0	0
	2. Admiral W. H. Maitland Dougall of Scotscraig,	0	10	0
DORKING, Silver Grey.	2 Hens—1. James M'Ara, Cultoquhey, Crieff,	1	0	0
	2. Admiral W. H. Maitland Dougall of Scotscraig,	0	10	0
DORKING, Silver Grey.	Cockerel.—1. Mrs George Armitstead, Inchture,	1	0	0
	2 Alexander M'Ara, Culdees, Muthill,	0	10	0
DORKING, Silver Grey.	2 Pullets.—1. Alexander M'Ara, Culdees, Muthill,	1	0	0
	2. Admiral W. H. Maitland Dougall of Scotscraig,	0	10	0
DORKING, Cold.	Cock.—1. Sir George Macpherson Grant, Bart., Ballindalloch,	1	0	0
	2. The Duchess Dowager of Athole, Dunkeld,	0	10	0
DORKING, Cold.	2 Hens.—1. The Duchess Dowager of Athole, Dunkeld,	1	0	0
	2. Sir George Macpherson Grant, Bart., Ballindalloch,	0	10	0
DORKING, Cold.	Cockerel.—1. Mrs George Armitstead, Inchture,	1	0	0
	2. Sir George Macpherson Grant, Bart., Ballindalloch,	0	10	0
	Carry forward,	£10	10	0

	Brought forward,	£10	10	0
DORKING, Cold.	2 Pullets.—1. D. J. T. Gray, Claverhouse Mains, Dundee,	1	0	0
	2. Sir George Macpherson Grant, Bart., Ballindalloch,	0	10	0
COCHIN-CHINA.	Cock.—1. Mrs Davidson, Star Hotel, Montrose,	1	0	0
	2. James Stoole, 65 North Church Street, Dundee,	0	10	0
COCHIN-CHINA.	2 Hens.—1. Captain Forsyth Grant of Ecclescraig, Montrose,	1	0	0
BRAMAHPOOTRA.	Cock.—1. No award.			
	2. Captain Forsyth Grant of Ecclescraig, Montrose,	0	10	0
BRAMAHPOOTRA.	2 Hens.—1. John Sandeman, Dundee,	1	0	0
	2. John Sandeman, Dundee,	0	10	0
BRAMAHPOOTRA.	Cockerel.—1. No award.			
	2. D. J. T. Gray, Claverhouse Mains, Dundee,	0	10	0
SPANISH.	Cock.—1. William Street, Burghmuir, Stirling,	1	0	0
SPANISH.	2 Hens.—1. William Street, Burghmuir, Stirling,	1	0	0
	2. James Norval, Hawkhill, Alloa,	0	10	0
SCOTCH GREY.	Cock.—1. James Picken, Laigh Langside, Kilmarnock,	1	0	0
	2. Clarkson & Hamilton, Carluke,	0	10	0
SCOTCH GREY.	2 Hens.—1. James Picken, Laigh Langside, Kilmarnock,	1	0	0
	2. Clarkson & Hamilton, Carluke,	0	10	0
SCOTCH GREY.	Cockerel.—1. Clarkson & Hamilton, Carluke,	1	0	0
	2. James Picken, Laigh, Langside, Kilmarnock,	0	10	0
SCOTCH GREY.	2 Pullets.—1. Andrew Reid, Netherton, Carmichael, Thankerton,	1	0	0
	2. Clarkson & Hamilton, Carluke,	0	10	0
HAMBURG, Spangled	Cock.—1. John Lindsay, Thornhill, Stewarton,	1	0	0
	2. Mrs A. Robertson Rae, Woodlee, Hamilton,	0	10	0
HAMBURG, Spangled.	2 Hens.—1. John Lindsay, Thornhill, Stewarton,	1	0	0
	2. G. & D. Low, Carnoustie,	0	10	0
HAMBURG, Spangled.	Cockerel.—1. James Urquhart, Inverness,	1	0	0
	2. John Morrison, Ochil View Cottage, Alloa,	0	10	0
HAMBURG, Spangled.	2 Pullets.—1. James Urquhart, Inverness,	1	0	0
	2. John Morrison, Ochil View Cottage, Alloa,	0	10	0
POLISH.	2 Hens.—1. Thomas Thomson, Cellardyke,	1	0	0
POLISH.	Cockerel.—1. No award.			
	2. Mrs George Armitstead, Inchmartine, Inchture,	0	10	0
POLISH.	Two Pullets.—1. No award.			
	2. Mrs George Armitstead, Inchmartine, Inchture,	0	10	0
GAME—Black or Brown Reds.	Cock.—1. James Falconer, St. Ann's, Lasswade,	1	0	0
	2. Robert Stark, Kirkcaldy,	0	10	0
GAME—Black or Brown Reds.	1 Hen.—1. D. Harley, Hillwood, Ratho,	1	0	0
	2. James Falconer, Lasswade,	0	10	0
GAME—Black or Brown Reds.	Cockerel.—1. D. Harley, Hillwood, Ratho,	1	0	0
	2. James Falconer, Lasswade,	0	10	0
GAME—Black or Brown Reds.	1 Pullet.—1. D. Harley, Hillwood, Ratho,	1	0	0
	2. James Falconer, Lasswade,	0	10	0
GAME—Any other Variety.	Cock.—1. D. Harley, Hillwood, Ratho (Duckwing),	1	0	0
	2. James Falconer, Lasswade (Duckwing),	0	10	0
GAME—Any other Variety.	1 Hen.—1. James Falconer, Lasswade (Pile),	1	0	0
	2. D. Harley, Hillwood, Ratho (Duckwing),	0	10	0
GAME—Any other Variety.	Cockerel.—1. D. Harley, Hillwood, Ratho (Duckwing),	1	0	0
GAME—Any other Variety.	1 Pullet.—1. D. Harley, Hillwood, Ratho (Duckwing),	1	0	0
POULTRY—Other Pure Breed.	Cock.—1. No award.			
	2. The Earl of Mansfield, K.T. (White Dorking),	0	10	0
POULTRY—Other Pure Breed.	2 Hens.—1. The Earl of Mansfield, K.T. (White Dork.),	1	0	0
POULTRY—Other Pure Breed.	Cockerel.—1. W. H. Benvie, Dundee (Creve Cœur),	1	0	0
	2. John Lindsay, Stewarton (White Leghorns),	0	10	0
POULTRY—Other Pure Breed.	2 Pullets.—1. W. H. Benvie, Dundee (Creve Cœur),	1	0	0
	2. John Lindsay, Stewarton (White Leghorns),	0	10	0
BANTAMS—Game.	Cock.—1. James Falconer, Lasswade,	1	0	0
	2. J. D. Donald, 13 Castle Place, Montrose,	0	10	0
	Carry forward,	£20	10	0

	Brought forward,	£50	10	0
BANTAMS—Game. 1 Hen.—1. D. Harley, Hillwood, Ratho,		1	0	0
2. James Falconer, Lasswade,		0	10	0
BANTAMS—Game. Cockerel.—1. James Falconer, Lasswade,		1	0	0
2. Robert E. Frew, Kirkcaldy,		0	10	0
BANTAMS—Game. 1 Pullet.—1. James Falconer, Lasswade.		1	0	0
2. D. Harley, Hillwood, Ratho,		0	10	0
BANTAMS—Sebright. Cock.—1. Miss Robina Frew, Kirkcaldy,		1	0	0
2. James Rutherford, Nochnarrie, Auchtermuchty,		0	10	0
BANTAMS—Sebright. 2 Hens.—1. Miss Rachel C. Frew, Kirkcaldy,		1	0	0
BANTAMS—Other Variety. Cock.—1. Capt. F. Grant, Ecclesgreig (Black Rose Comb),		1	0	0
BANTAMS—Any other Variety. 2 Hens.—1. J. D. Donald, Montrose (Black).		1	0	0
DUCKS—White Aylesbury. Drake.—1. Robert Wallace, Auchenbrain, Mauchline,		1	0	0
2. D. Harley, Hillwood, Ratho,		0	10	0
DUCKS—White Aylesbury. 1 Duck.—1. Robert Wallace, Auchenbrain, Mauchline,		1	0	0
2. D. Harley, Hillwood, Ratho,		0	10	0
DUCKS—White Aylesbury. Drake (Young).—1. Robert Wallace, Mauchline,		1	0	0
DUCKS—White Aylesbury. 1 Duckling.—1. Robert Wallace, Mauchline,		1	0	0
DUCKS—Rouen. Drake.—1. Admiral W. H. Maitland Dougall of Scotscraig,		1	0	0
2. Robert Wallace, Auchenbrain, Mauchline,		0	10	0
DUCKS—Rouen. 1 Duck.—1. Admiral W. H. Maitland Dougall of Scotscraig,		1	0	0
2. William Hart, Kirkland, Auchterarder,		0	10	0
DUCKS—Rouen. Drake (Young).—1. Admiral W. H. Maitland Dougall of Scotscraig,		1	0	0
DUCKS—Rouen. 1 Duckling.—1. Admiral W. H. Maitland Dougall of Scotscraig,		1	0	0
DUCKS—Other Pure Breed. Drake.—1. The Viscountess Stormont (Buenos Ayres),		1	0	0
DUCKS—Other Pure Breed. 1 Duck.—1. The Viscountess Stormont (Buenos Ayres),		1	0	0
DUCKS—Other Pure Breed. 1 Duckling.—1. Capt. F. Grant of Ecclescraig (Pekin),		1	0	0
TURKEYS—Black Norfolk. Cock.—1. Wm. Mackenzie, Inverquharity, Kirriemuir,		1	0	0
2. Admiral Maitland Dougall of Scotscraig,		0	10	0
TURKEYS—Black Norfolk. 1 Hen.—1. Admiral Maitland Dougall of Scotscraig,		1	0	0
2. William Mackenzie, Inverquharity, Kirriemuir,		0	10	0
TURKEYS—Other Breed. Cock.—1. W. Wykes, Wolvey, Hinckley (Cambridge),		1	0	0
2. Capt. F. Grant of Ecclescraig (American Bronze),		0	10	0
TURKEYS—Other Breed. 1 Hen.—1. W. Wykes, Wolvey, Hinckley (Cambridge),		1	0	0
2. T. L. M. Cartwright, Ladybank (South American),		0	10	0
TURKEYS—Other Breed. Cock (Poult).—1. W. Wykes, Hinckley (Cambridge),		1	0	0
TURKEYS—Other Breed. 1 Hen (Poult).—1. W. Wykes, Hinckley (Cambridge),		1	0	0
GEESE—Grey Toulouse. Gander.—1. S. S. Lloyd, M.P., Moor Hall, Birmingham,		1	0	0
2. Alex. Thomson, Mains, Tillicoultry,		0	10	0
GEESE—Grey Toulouse. 1 Goose.—1. S. S. Lloyd, M.P., Moor Hall, Birmingham,		1	0	0
2. Alex. Thomson, Mains, Tillicoultry,		0	10	0
GEESE—Grey Toulouse. Gander (Young).—1. S. S. Lloyd, M.P., Birmingham,		1	0	0
GEESE—Grey Toulouse. 1 Gosling.—1. S. S. Lloyd, M.P., Moor Hall, Birmingham,		1	0	0
		£85	10	0

Class VI.—WOOL.

Section 1. Five Fleeces of CHEVIOT WHITE WOOL.—Not forward.

Section 2. Five Fleeces of BLACKFACED WHITE WOOL.

1. George Warnock, Todlaw, Stockbriggs,	3	0	0
2. George Warnock, Todlaw, Stockbriggs,	2	0	0

Section 3. Five Fleeces of LEICESTER WOOL.

1. Thomas Ferguson, Kinnochtry, Coupar-Angus,	3	0	0
2. Thomas Ferguson, Kinnochtry, Coupar-Angus,	2	0	0
	£10	0	0

Class VII.—DAIRY PRODUCE.

Section 1. CURED BUTTER, not less than 7 lbs.

1. Henry Orr, Torrance, Bathgate,	£6	0	0
2. Robert Hamilton, Denmarkfield, Luncarty,	4	0	0
3. Donald M'Farlane, Balmuildy, Bishopbriggs,	2	0	0

C., Colonel W. MacDonald MacDonald of St Martins, Perth.

Section 2. POWDERED BUTTER, not less than 7 lbs.

1. R. T. N. Speir of Culdees, Muthill, Perthshire,	6	0	0
2. Henry Orr, Torrance, Bathgate,	4	0	0
3. Archibald Cullen, Woodend, Airdrie,	2	0	0

C., Colonel W. MacDonald MacDonald of St Martins, Perth.

Section 3. FRESH BUTTER—Three ½ lb. Rolls.

1. The Earl of Mansfield, K.T., Scone Palace, Perth,	6	0	0
2. R. T. N. Speir of Culdees, Muthill, Perthshire,	4	0	0
3. Colonel W. MacDonald MacDonald of St Martins, Perth,	2	0	0

V. H. C., John Lindsay, Thornhill, Stewarton. H. C., Robert Hamilton, Denmarkfield, Luncarty. C., Alexander Bonthrone, Newton House, Falkland.

Section 4. CHEDDAR CHEESE—56 lbs. and upwards.

1. James Milroy, Galdenoch, Stoneykirk, Stranraer,	8	0	0
2. John Lindsay, Thornhill, Stewarton,	6	0	0
3. John Gibb, Shields Main, Biggar,	4	0	0

C., Robert Drummond, Pocknave, Ayrshire.

Section 5. CHEDDAR CHEESE—14 lbs. and under.

1. Robert Drummond, Pocknave, Craigie, Ayrshire,	5	0	0
2. John Lindsay, Thornhill, Stewarton,	3	0	0
3. John Gibb, Shields Mains, Biggar,	2	0	0

Section 6. DUNLOP CHEESE—30 lbs. and upwards.

1. The Duke of Buccleuch and Queensberry, K.G., Drumlanrig, Thornhill,	5	0	0
2. John Gibb, Shields Mains, Biggar,	3	0	0

Section 7. CHEESE—Any other Variety—30 lbs. and upwards.

1. No award.			
2. John Lindsay, Thornhill, Stewarton,	3	0	0

Section 8. CHEESE—Any Variety—15 lbs. and under.

1. Robert Drummond, Pocknave, Craigie, Ayrshire,	5	0	0
2. John Lindsay, Thornhill, Stewarton,	3	0	0
	£83	0	0

CALEDONIAN APIARIAN SOCIETY.

Grant to, for 1879,	£20	0	0
David Wilkie, Gourock.—Bee-Driving, Silver Medal	0	16	0
	£20	16	0

ABSTRACT OF PREMIUMS.

Cattle,	£1003	11	0
Horses,	871	16	0
Sheep,	370	6	6
Swine,	85	0	0
Poultry,	85	10	0
Wool,	10	0	0
Dairy Produce,	83	0	0
Caledonian Apiarian Society,	20	16	0
	£2529	19	6

LIST OF JUDGES.

SHORTHORN.—John Cran, Kirkton, Inverness; Andrew Mitchell, Alloa; John Wood, 8 The Crescent, Ripon.

POLLED ANGUS OR ABERDEEN.—James Mackessack, Earnside, Forres; James Reid, Greystone, Alford, Aberdeenshire; William Smith, Stone of Morphie, Montrose.

GALLOWAY.—Maxwell Clark of Little Culmain, Crocketford, Dumfries; James Grierson, Kirkland, Haugh of Urr, Dalbeattie.

AYRSHIRE.—Andrew Allan, Munnoch, Dalry, Ayr; John Fleming, Meadowbank Cottage, Strathaven; Hugh Kirkwood, Killermont, Maryhill, Glasgow.

HIGHLAND.—Duncan M'Diarmid, Camuserricht, Rannoch; Alexander MacDonald, Balranald, Lochmaddy; James J. Robertson, Glencripesdale, Strontian.

FAT STOCK.—William Crawford, Balgarvie, Perth; James Peebles, Mains of Cargill, Meikleour, Perth; Alex. Young, Keir Mains, Dunblane.

DRAUGHT STALLIONS AND ENTIRE COLTS.—Archibald K. Leitch, Inchstelly, Forres; Andrew Warnock, Bearyards, Bishopbriggs; Robert Wilson, Leithen Hall, Wamphray, N.B.

DRAUGHT MARES, FILLIES, AND GELDINGS.—Oliphant Brown, Shiel, New Galloway; Robert M'Kean, Lumloch, Bishopbriggs; Robert Renwick, Dalmuir, Duntocher.

HUNTERS, ROADSTERS, PONIES, AND EXTRA HORSES.—Colonel Hay Boyd of Townend, Symington, Kilmarnock; J. Anstruther Thomson of Charleton, Colinsburgh; D. R. Williamson of Lawers, Crieff.

BLACKFACED.—James Archibald, Glengelt, Lauder; John Johnstone, Kingledores, Biggar; Donald M'Intyre, Tighnablair, Comrie.

CHEVIOT.—William Grieve, Skelfhill, Hawick; William Mitchell, Ribigill, Tongue, Sutherland; John Robson, jun., Birness, Rochester.

BORDER LEICESTER.—William Ford, Hardengreen, Dalkeith; George Torrance, Sisterpath, Dunse; Jacob Wilson, Woodhorn Manor, Morpeth.

LEICESTER, COTSWOLD, LINCOLN, AND SHORT-WOOLLED.—James Skirving, Luffness Mains, Drem; Robert C. Yeoman, Marsk Hall, Marsk by the Sea.

SWINE.—The judges of Fat Stock.

POULTRY.—James Dixon, North Park, Clayton, Bradford; David Stratton, 13 Middleby Street, Edinburgh.

WOOL.—The judges of the various classes of Sheep.

DAIRY PRODUCE.—John M'Ewen, Stirling; W. B. Gloag, Perth.

LIST OF ATTENDING MEMBERS.

SHORTHORN.—James Small of Dirnanean; James Leslie, The Thorn.

POLLED ANGUS OR ABERDEEN.—John Drummond of Blackruthven; Robert Clark, Taybank.

GALLOWAY.—James Townsend Oswald of Dunnikier; Thomas Ross, Bachilton.

AYRSHIRE.—Alex. Bethune of Blebo; David Bell, Todhall, Cupar-Fife.

HIGHLAND.—Colonel Ogilvy, yr. of Inverquharity; William Dingwall, Ramornie.

FAT STOCK AND SWINE.—J. B. Pople of Newhouse; Dean of Guild Dewar.

DRAUGHT STALLIONS AND ENTIRE COLTS.—Admiral Maitland Dougall of Scotscraig, Tayport John Ballingall, Dunbog, Newburgh.

DRAUGHT MARES, FILLIES, AND GELDINGS.—Hon. George Waldegrave Leslie; Thomas M. Tod of West Brackly.

HUNTERS, ROADSTERS, PONIES, AND EXTRA HORSES.—Viscount Stormont; Robert Gardiner, Chapelbank.

BLACKFACED.—Harry Young of Cleish Castle; John Richmond, Dron.

CHEVIOT.—John Robertson, Old Blair; William Whyte, Hatton of Eassie.

BORDER LEICESTER.—C. T. C. Grant of Kilgraston; William Tod, Gospetry.

LEICESTER, COTSWOLD, LINCOLN, AND SHORT-WOOLLED.—Sir John Marjoribanks of Lees, Bart. Thomas Ferguson, Kinnochtry.

POULTRY.—Councillor Galloway; Alexander Hay, Victoria Auction Mart.

DAIRY PRODUCE.—James Marshall of Duncrevie; John M. Fraser, Perth Auction Market.

IV.—DISTRICT COMPETITIONS

CATTLE.

NAME OF DIST.	PREMIUM AWARDED TO	FOR			AMOUNT		
East Kilbride	Thomas Tennant, Rylands	Ayrshire Bull		Silver Medal	£0	16	0
	John Young, Cobblebrae	do.	Class I.†	£4 & Med. Sil. Med.	4	10	6
	James Morton, Kirktownmuir	do.	do.		3	0	0
	Thos. Ballantyne, Netherton	do.	do.		1	0	0
	T. D. C. Graham, Dunlop House	do.	Class II.‡	£3 & Med. Sil. Med.	3	10	6
	John Mitchell, Cairn	do.	do.		2	0	0
	John Young, Cobblebrae	do.	do.		1	0	0
	James Scott, Newlands	Ayrshire Heifer		£3 & Med. Sil. Med.	3	10	6
	James Hamilton, Whiteshawgate	do.			2	0	0
	James Williamson, Greenhead	do.			1	0	0
County of Kincardine	David A. Pearson of Johnstone	Polled Bull		Silver Medal	0	16	0
	James L. Rust, Bowbutts	Shorthorn Heifer		£1, 10s. & Med. Sil. Med.	2	0	6*
	John Stott, Greenheads	do.			1	0	0
Garioch	A. M. Gordon of Newton	Shorthorn Bull		Silver Medal	0	16	0
	Robert Maitland, Balhagardy	Polled Bull	Class I.	£4 & Med. Sil. Med.	4	10	6
	Henry D. Adamson, Balquharn	do.	do.		3	0	0
	Alex. Joss, Cruichie	do.	do.		1	0	0
	Mrs Bruce, Nether Boddam	Shorthorn Bull	Class II.	£3 & Med. Sil. Med.	3	10	6
	John Cooper, Wraes	do.	do.		2	0	0
	James Stephen, Conglass	Polled Heifer		£3 & Med. Sil. Med.	3	10	6
	Alexander Joss, Cruichie	do.			2	0	0
	Robert Maitland, Balhagardy	do.			1	0	0
Strathbogie	James Merson, Craigwillie	Shorthorn Bull	Class I.	£2 & Med. Sil. Med.	2	10	6*
	John Lipp, Haddoch	do.	do.		1	10	0*
	Walter Scott, Glendronach	do.	Class II.	£3 & Med. Sil. Med.	3	10	6
	James Bruce, Burnside	do.	do.		2	0	0
	William Stewart, Auchindellan	do.	do.		1	0	0
	James Bruce, Collithie	Polled Heifer		£3 & Med. Sil. Med.	3	10	6
	Alexander Geddes, Invermarkie	do.			2	0	0
	Alexander Joss, Cruichie	do.			1	0	0
United Banffshire	Andrew Longmore, Rettie	Shorthorn Bull		Silver Medal	0	16	0
	James Bruce, Burnside	do.	Class I.	£4 & Med. Sil. Med.	4	10	6
	Andrew Longmore, Rettie	do.	do.		3	0	0
	James Murray, Fauchfaulds	do.	do.		1	0	0
	D. C. Bruce, Broadland	do.	Class II.	£3 & Med. Sil. Med.	3	10	6
	William Murray, Pittendrigh	do.	do.		2	0	0
	Walter Scott, Glendronach	do.	do.		1	0	0
	John Hannay, Gavenwood	Polled Heifer		£3 & Med. Sil. Med.	3	10	6
	Robert Walker, Montbletton	do.			2	0	0
	John Hannay, Gavenwood	do.			1	0	0
Turriff	George Bean, Balquhain	Polled Bull	Class I.	£4 & Med. Sil. Med.	4	10	6
	William Beedie, Pitgair	do.	do.		3	0	0
	George Barclay, Yonderton	do.	do.		1	0	0
	James Smith, Auchlin	do.	Class II.	£3 & Med. Sil. Med.	3	10	6
	Robert Walker, Montbletton	do.	do.		2	0	0
	George Alexander, Balnoon	do.	do.		1	0	0
	James Murray, Mill of Laithers,	Shorthorn Heifer		£3 & Med. Sil. Med.	3	10	6
	Alex. Scott, Towie Barclay	do.			2	0	0
	William Mackie, Petty	do.			1	0	0
				Carry forward.	£108	12	0

* Half Premiums awarded, the number of Lots being under four.
† Aged Bulls. ‡ Two-year-old Bulls.

NAME OF DIST.	PREMIUM AWARDED TO	FOR		AMOUNT.
			Brought forward,	£108 12 0
Avondale	Thomas Tennant, Strathaven	Ayrshire Bull	Silver Medal	0 16 0
	Robert Sandilands, Cumberhead	do.	Class I. £4 & Med. Sil. Med.	4 10 6
	Thomas Tennant, Strathaven	do.	do.	3 0 0
	J. A. Hamilton, Whitshawgate	do.	do.	1 0 0
	Alexander Craig, Overmilton	do.	Class II. £3 & Med. Sil. Med.	3 10 6
	Robert Lohoar, Dykehead	do.	do.	2 0 0
	William Bryson, Cauldcoats	do.	do.	1 0 0
	J. A. Hamilton, Whitshawgate	Ayrshire Heifer	£3 & Med Sil. Med.	3 10 6
	John Allan, Lower Muir	do.		2 0 0
	J. A. Hamilton, Whitshawgate	do.		1 0 0
Wem	Duncan M'Diarmid, Camuserricht	Highland Bull	Silver Medal	0 16 0
	Arch. M'Gregor, Glenlyon House	do	Class I. £2 & Med. Sil. Med.	2 10 6*
	Duncan M'Diarmid, Camuserricht	do.	do.	1 10 0*
	Finlay M'Nab, Camghouran	do.	do.	0 10 0*
	Duncan M'Diarmid, Camuserricht	do.	Class II. £3 & Med. Sil. Med.	3 10 6
	A. S. Campbell, Drumchastle	do.	do.	2 0 0
	Arch. M'Gregor, Glenlyon House	do.	do.	1 0 0
	Duncan M'Diarmid, Camuserricht	Highland Heifer	£3 & Med. Sil. Med	3 10 6
	Duncan M'Diarmid, Camuserricht	do.		2 0 0
	Arch. M'Gregor, Glenlyon House	do.		1 0 0
Deeside	J. & A. Dewar, Bethlin	Shorthorn Bull	Class I. £2 & Med. Sil. Med.	2 10 6*
	James Ross, Bankhead	do.	do.	1 10 0*
	David Nicol, Anguston	do.	Class II. £3 & Med. Sil. Med.	3 10 6
	Lewis Strachan, Cluny	do.	do.	2 0 0
	James Rust, Bowbutts	do.	do.	1 0 0
	George Hamilton, Skene House	Polled Heifer	£3 & Med. Sil. Med.	3 10 6
	George Hamilton, Skene House	do.		2 0 0
	William Ross, Annesley	do.		1 0 0
Lorn	John Sinclair, Strontollier	Highland Bull	Silver Medal	0 16 0
	Dun. Sinclair, Culnadallach, and John M'Coll, Stonfield	do.	Class I. £4 & Med. Sil. Med.	4 10 6
	Dugald Campbell, Kilbride	do.	do.	3 0 0
	Duncan M'Callum, Clenmackrie	do.	do.	1 0 0
	Duncan M'Callum, Clenmackrie	do.	Class II. £3 & Med. Sil. Med.	3 10 6
	Duncan M'Callum, Clenmackerie	do.	do.	2 0 0
	C arles M'Lean, Pennyfuir	do.	do.	1 0 0
	D. & J. M'Gregor, Ardconnel	Highland Heifer	£3 & Med. Sil. Med.	3 10 6
	Duncan M'Callum, Clenmackrie	do.		2 0 0
	John M'Diarmid, Balinoe	do.		1 0 0
Upper Strathearn	C. S. H. Drummond Moray of Abercairny	Shorthorn Bull	Silver Medal	0 16 0
	John Comrie, Auchengarrick	Ayrshire Heifer	Med. Sil. Med.	0 10 6
Formartine	Alex. Davidson, Mains of Cairnbrogie	Shorthorn Bull	Silver Medal	0 16 0
	James Thomson, Newseat of Dumbreck	do.	Class I. Med. Sil. Med.	0 10 6
	William Duthie, Collynie	do.	Class II. Med. Sil. Med.	0 10 6
	James Strath, Cauldhame	Polled Heifer	Med. Sil. Med.	0 10 6
Kinglassie	Peter Blyth, Kinninmonth	Shorthorn Bull	Class II. Med. Sil. Med.	0 10 6
	John Armour, Goatmilk	Shorthorn Heifer	Med. Sil. Med.	0 10 6
			Carry forward,	£193 11 0

* Half Premiums awarded, the number of lots being under four.

NAME OF DIST.	PREMIUM AWARDED TO	FOR		AMOUNT.		
			Brought forward,	£193	11	0
County of Ayr	James Duncan, Meikle Kilchattan	Ayrshire Cow	Silver Medal	0	15	0
	Duke of Buccleuch and Queensberry	Ayrshire Bull	Med. Sil. Med.	0	10	6
	James Picken, Laigh Langside	Brood Mare	Med. Sil. Med.	0	10	6
	David Riddell, Blackhall	Entire Colt	Med. Sil. Med.	0	10	6

HORSES FOR AGRICULTURAL PURPOSES.

East Dist. of Berwickshire	Robert Duncan, Brockwell Muir	Stallion	25	0	0
Lauderdale	Peter M'Robbie, Sunnyside	Stallion	25	0	0
Muchars	John Duncan, Ardo	Stallion	25	0	0
Peeblesshire	Andrew Montgomery, Borland	Stallion	25	0	0
East Dist. of Stirlingshire	Eastern District of Stirlingshire Association	Stallion	25	0	0
Lesmahagow	David Riddell, Blackhall	Stallion	25	0	0
Carrick	David Riddell, Blackhall	Stallion	25	0	0
Dalbeattie	Andrew Montgomery, Boreland	Brood Mare	£4 & Med. Sil. Med.	4	10	6
	David A. Hood, Balgreddan	do.		3	0	0
	James Muir, Lochfergus	do.		1	0	0
Rhins Dist. of Wigtownshire	James Milroy, Galdenoch	Brood Mare	£4 & Med. Sil. Med.	4	10	6
	James M'Master, Currochtree	do.		3	0	0
	Alexander Rankin, Aird	do.		1	0	0
Auchtermuchty	James Blyth, Leckiebank	Brood Mare	£4 & Med. Sil. Med.	4	10	6
	William Thom, Demperstone	do.		3	0	0
	James Thom, Leden Urquhart	do.		1	0	0
East of Fife	James Reid, Gibleston	Brood Mare	£4 & Med. Sil. Med.	4	10	6
	James Blyth, Leckiebank	do.		3	0	0
	James Fleming, Grangemuir	do.		1	0	0
County of Clackmannan	James M'Nab, Glenochil	Brood Mare	£4 & Med. Sil. Med.	4	10	6
	Alexander Thomson, Mains	do.		3	0	0
	Jobson Fernie, Shrumockhill	do.		1	0	0
Lockerbie	Mrs White, Nethercleugh	Brood Mare	£4 & Med. Sil. Med.	4	10	6
	Thomas Wright, Bengall	do.		3	0	0
	John Common, Corrielaw	do.		1	0	0
West. Dist. of Fifeshire	James Drummond, Blacklaw	Two-year old Colt	£3 & Med. Sil. Med.	3	10	6
	A. Henderson, Grange	do.		2	0	0
	Robert Guild, Flockhouse	do.		1	0	0
	Thomas Muirhead, Townhill	One-year old Colt	£2 & Med. Sil. Med.	2	10	6
	John Grieve, Langlees	do.		1	0	0
	Alexander Brown, The Lynn	do.		0	10	0
	Thomas Muirhead, Townhill	Two-year old Filly	£3 & Med. Sil. Med.	3	10	6
	Thomas Crawford, Pitbauchlie	do.		2	0	0
	David Nasmyth, Monziehill	do.		1	0	0
	Thomas Muirhead, Townhill	One-year old Filly	£2 & Med. Sil. Med.	2	10	6
	Thomas Muirhead, Townhill	do.		1	0	0
	Thomas Crawford, Pitbauchlie	do.		0	10	0
			Carry forward,	£443	3	9

NAME OF DIST.	PREMIUM AWARDED TO	FOR	AMOUNT.
		Brought forward,	£443 3 6
Strathendrick	Peter Crawford, Dumgoyack	Two-year old Colt . £3 & Med. Sil. Med.	3 10 6
	Peter Crawford, Dumgoyack	do.	2 0 0
	Robert M'Arthur, Borland	do.	1 0 0
	David Edmond, Ballochruin	One-year old Colt . £2 & Med. Sil. Med.	2 10 6
	Mrs Blackburn, Killearn House	do.	1 0 0
	Wm. Mackie, Laigh Finnich	do.	0 10 0
	W. Edmond, Hillhead of Catter	Two-year old Filly . £3 & Med. Sil. Med.	3 10 6
	Robert Miller, Third	do.	2 0 0
	James Shaw, Wester Mye	do.	1 0 0
	Alex. Galbraith, Croy Cunningham	One-year old Filly . £2 & Med. Sil. Med.	2 10 6
	Alex. Galbraith, Croy Cunningham	do.	1 0 0
	Gilbert Beith, Ballochneck	do.	0 10 0
Easter Ross	Alexander Munro, Ord	Two-year old Colt . £3 & Med. Sil. Med.	3 10 6
	John Robertson of Rhynie	do.	2 0 0
	George Forbes Irvine, Nigg	do.	1 0 0
	John Forsyth, Bellevue	One-year old Colt . £1 & Med. Sil. Med.	1 10 6*
	John Robertson, Rhynie	do.	0 10 0*
	James Ross, Balblair	do.	0 5 0*
	Alexander Munro, Ord	Two-year old Filly . £3 & Med. Sil. Med.	3 10 6
	T. A. R. Anderson, Nonikiln	do.	2 0 0
	Andrew Munro, Balintraid	do.	1 0 0
	George Forbes Irvine, Nigg	One-year old Filly . £2 & Med. Sil. Med.	2 10 6
	John Gordon, Balmuchy	do.	1 0 0
	T. A. R. Anderson, Nonikiln	do.	0 10 0
Dist. of Royal Northern Society	Peter M'Robbie, Sunnyside	Two-year old Colt . £3 & Med. Sil. Med.	3 10 6
	Wm. Miller, Pond Cottage	do.	2 0 0
	James Durno, Jackstown	do.	1 0 0
	George Wilson, Whiteside	One-year old Colt . £2 & Med. Sil. Med.	2 10 6
	John Marr, Cairnbrogie	do.	1 0 0
	R. B. Walker, Portlethan Mains	do.	0 10 0
	John Marr, Cairnbrogie	Two-year old Filly . £3 & Med. Sil. Med.	3 10 6
	P. Bruce, Myreton	do.	2 0 0
	James Smith, Pittengardner	do.	1 0 0
	David Walker, Coullie	One-year old Filly . £2 & Med. Sil. Med.	2 10 6
	James Scott, St Mary's	do.	1 0 0
	Charles Alexander, Beidlieston	do.	0 10 0
		SHEEP.	
Badenoch and Strathspey	Donald Stewart, Chapel Park	Blackfaced Tup . £3 & Med. Sil. Med.	3 10 6
	R. Macgregor, Kincraig	do.	1 0 0
	R. Macgregor, Kincraig	do.	0 10 0
	R. Macgregor, Kincraig	Blackfaced Shear. Tup £3 & Med. Sil. Med.	3 10 6
	John Kennedy, Soillerie	do.	1 0 0
	John Kennedy, Soillerie	do.	0 10 0
	Donald Stewart, Chapel Park	Blackfaced Ewes . £3 & Med. Sil. Med.	3 10 6
	A. Macrae, Ruthven	do.	1 0 0
	R. Macgregor, Kincraig	do.	0 10 0
	R. Macgregor, Kincraig	Blackfaced Gimmers £3 & Med. Sil. Med.	3 10 6
	Donald Stewart, Chapel Park	do.	1 0 0
	C. F. Gwyer, Biallid	do.	0 10 0
County of Sutherland	Duke of Sutherland	Cheviot Tup . Silver Medal	0 16 0
	J. B. Dudgeon, Crakaig	do. . £3 & Med. Sil. Med.	3 10 6
	J. B. Dudgeon, Crakaig	do.	1 0 0
	W. Mitchell, Ribigill	do.	0 10 0
		Carry forward,	£550 13 0

* Half Premiums awarded, the number of Lots being under four.

NAME OF DIST.	PREMIUM AWARDED TO	FOR		AMOUNT.		
		Brought forward.		£607	14	0
	J. B. Dudgeon, Crakaig	Cheviot Shearling Tup	£3 & Med. Sil. Med.	2	10	0
	W. Mitchell, Ribigill	do.		1	0	0
	J. B. Dudgeon, Crakaig	do.		0	10	0
	J. B. Dudgeon, Crakaig	Cheviot Ewes	£3 & Med. Sil. Med.	2	10	0
	J. B. Dudgeon, Crakaig	do.		1	0	0
	W. Mitchell, Ribigill	do.		0	10	0
	J. B. Dudgeon, Crakaig	Cheviot Gimmers	£3 & Med. Sil. Med.	2	10	0
	J. B. Dudgeon, Crakaig	do.		1	0	0
	W. Mitchell, Ribigill	do.		0	10	0
West Linton	Duke of Buccleuch	Leicester Tup	Silver Medal	0	10	0
	John Ainslie, jun., Hillend	do.	£1, 10s. & Med. Sil. Med.	2	0	0*
	John Edgar, Kirkettle	do.		0	10	0*
	Robert White, Outerstone	do.		0	5	0*
	John Edgar, Kirkettle	Leicester Shear. Tup	£3 & Med. Sil. Med.	3	10	0
	John Ainslie, jun., Hillend	do.		1	0	0
	John Edgar, Kirkettle	do.		0	10	0
	John Edgar, Kirkettle	Leicester Ewes	£3 & Med. Sil. Med.	3	10	0
	Robert White, Outerstone	do.		1	0	0
	John Cairns, Winkstone	do.		0	10	0
	John Edgar, Kirkettle	Leicester Gimmers	£1, 10s. & Med. Sil. Med.	2	0	0*
	John Ainslie, jun., Hillend	do.		0	10	0*
	R. G. Murray, Spittal	do.		0	5	0*
Newcastle Provincial Club	A. J. Balfour of Strathconan, M.P.	Blackfaced Tup	Silver Medal	0	10	0
	Peter Robertson, Achilty	do.	£3 & Med. Sil. Med.	3	10	0
	Charles Flower, Glencassley	do.		1	0	0
	James A. Gordon, Udale	do.		0	10	0
	Peter Robertson, Achilty	Blackfaced Shearling Tup	£3 & Med. Sil. Med.	3	10	0
	Geo. Smith Grant, Achorachan	do.		1	0	0
	Geo. Smith Grant, Achorachan	do.		0	10	0
	James Macpherson, Clunas	Blackfaced Ewes	£3 & Med. Sil. Med.	3	10	0
	James A. Gordon, Udale	do.		1	0	0
	James A. Gordon, Udale	do.		0	10	0
	James A. Gordon, Udale	Blackfaced Gimmers	£3 & Med. Sil. Med.	3	10	0
	Peter Robertson, Achilty	do.		1	0	0
	James Macpherson, Clunas	do.		0	10	0
Nithsdale	James Brydon, jun., Holm of Dalquhairn	Cheviot Tup	£3 & Med. Sil. Med.	2	10	0
	James Brydon, Kinnelhead	do.		1	0	0
	John Borland, Auchencairn	do.		0	10	0
	James Brydon, Kinnelhead	Cheviot Shearling Tup	£3 & Med. Sil. Med.	3	10	0
	James Brydon, Kinnelhead	do.		1	0	0
	James Brydon, jun., Holm of Dalquhairn	do.		0	10	0
	James Brydon, Kinnelhead	Cheviot Ewes	£3 & Med. Sil. Med.	2	10	0
	Robert M'Gregor, Bellridding	do.		1	0	0
	Robert M'Gregor, Bellridding	do.		0	10	0
	James Brydon, Kinnelhead	Cheviot Gimmers	£1, 10s. & Med. Sil. Med.	2	0	0*
	Robert M'Gregor, Bellridding	do.		0	10	0*
	Robert M'Gregor, Bellridding	do.		0	5	0*
Athole and Weem	P. & D. Ferguson, Dalcapon	Leicester Tup	Silver Medal	0	16	0
	Robert Dow, Tullymet	do.	£1, 10s. & Med. Sil. Med.	2	0	0*
	Robert Dow, Tullymet	do.		0	10	0*
	W. Stewart, Auchlatt	do.		0	5	0*
	P. & D. Ferguson, Dalcapon	Leicester Shear. Tup	£1, 10s. & Med. Sil. Med.	2	10	0*
	P. & D. Ferguson, Dalcapon	do.		0	10	0*
	Adam Conacher, Mains	do.		0	5	0*
		Carry forward.		£607	14	0

* Half Premiums awarded, the number of Lots being under four.

NAME OF DIST.	PREMIUM AWARDED TO	FOR		AMOUNT.		
			Brought forward,	£607	14	6
	P. & D. Ferguson, Dalcapon	Leicester Ewes	£3 & Med. Sil. Med.	3	10	6
	P. & D. Ferguson, Dalcapon	do.		1	0	0
	Adam Conacher, Mains	do.		0	10	0
	Adam Conacher, Mains	Leicester Gimmers	£3 & Med. Sil. Med.	3	10	6
	P. & D. Ferguson, Dalcapon	do.		1	0	0
	P. & D. Ferguson, Dalcapon	do.		0	10	0
United East Lothian	Andrew Smith, Castle Mains	Leicester Shear. Tup	£3 & Med. Sil. Med	3	10	6
	Andrew Smith, Castle Mains	do.		1	0	0
	Adam Smith, Stevenson Mains	do.		0	10	0
Nether Lorn	Robert Allan, Glenmore	Blackfaced Tup	Silver Medal	0	16	0
	Dr Hugh Gillies, Dunmore	do.	£3 & Med. Sil. Med.	3	10	6
	Robert Allan, Glenmore	do.		1	0	0
	Alex. Gillies, Barnacarry	do.		0	10	0
	Dr Hugh Gillies, Dunmore	Blackfaced Shearling Tup	£3 & Med. Sil. Med.	3	10	6
	Robert Allan, Glenmore	do.		1	0	0
	John M'Diarmid, Balinoe	do.		0	10	0
	Robert Allan, Glenmore	Blackfaced Ewes	£3 & Med. Sil. Med.	3	10	6
	Allan Hall, Degnish	do.		1	0	0
	Robert Allan, Glenmore	do.		0	10	0
	Dr Hugh Gillies, Dunmore	Blackfaced Gimmers	£3 & Med. Sil. Med.	3	10	6
	K. Maclellan, Melfort	do.		1	0	0
	Allan Hall, Degnish	do.		0	10	0
Argyll	John Malcolm of Poltalloch	Blackfaced Tup	Silver Medal	0	16	0
	R. Allan, Glenmore	do.	£3 & Med. Sil. Med.	3	10	6
	R. Allan, Glenmore	do.		1	0	0
	R. Allan, Glenmore	do.		0	10	0
	R. Allan, Glenmore	Blackfaced Shear. Tup	£3 & Med. Sil. Med.	3	10	6
	R. Allan, Glenmore	do.		1	0	0
	Peter Sinclair, Upper Largie	do.		0	10	0
	Peter Sinclair, Upper Largie	Blackfaced Ewes	£1, 10s. & Med. Sil. Med.	2	0	6*
	R. Allan, Glenmore	do.		0	10	0*
	George Campbell, Ardifuir	do.		0	5	0*
	R. Allan, Glenmore	Blackfaced Gimmers	£1, 10s. & Med. Sil. Med.	2	0	6*
	Peter Sinclair, Upper Largie	do.		0	10	0
Island of Arran	James Allan, jun., Balnacoole	Blackfaced Tup	Med. Silver Medal	0	10	6
	James Allan, jun., Balnacoole	Blackfaced Shear. Tup	Med. Silver Medal	0	10	6
	James Allan, jun., Balnacoole	Blackfaced Ewes	Med. Silver Medal	0	10	6
	James Allan, jun., Balnacoole	Blackfaced Gimmers	Med. Silver Medal	0	10	6
Border Union	James Nisbet of Lambden	Border Leicester Tup	Silver Medal	0	16	0
	Thomas Elliot, Hindhope	Cheviot Tup	Med. Silver Medal	0	10	6
	Andrew Smith, Castle Mains	Border Leicester Shear. Tup	Med. Sil. Med.	0	10	6
	John Thompson, Bailliknowe	Border Leicester Gimmers	Med. Sil. Med.	0	10	6
Islay, Jura, and Colonsay	A. M'Connechy, Bridgend	Blackfaced Tup	Silver Medal	0	16	0
	M. Simpson, Knocklearach	do.	Med. Silver Medal	0	10	6
	A. & J. W. Greenlees, Finlaggan	Blackfaced Shear. Tup	Med. Silver Medal	0	10	6
	A. M'Connechy, Bridgend	Blackfaced Ewes	Med. Silver Medal	0	10	6
	S. Mitchell, Neriby	Blackfaced Gimmers	Med. Silver Medal	0	10	6
				£667	4	6

SPECIAL GRANTS.

Edinburgh Christmas Club	Vote in aid of Premiums,	£50	0	0
Ayrshire Association	Vote to Dairy Produce Show at Kilmarnock,	20	0	0
Unst Society	Vote in aid of Premiums,	3	0	0
Rousay Society	Vote in aid of Premiums,	3	0	0
Orkney Society	Vote in aid of Premiums,	3	0	0
Egilshay Society	Vote in aid of Premiums,	3	0	0
		£82	0	0

* Half Premiums awarded, the number of lots being under four.

MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

Medium Silver Medals were awarded to the following:—

Aberdeenshire.

NAME OF DISTRICT.	MEDAL AWARDED TO	FOR
Donside	George Thompson of Pitmedden	Swedish Turnips
	James Rennie, Milltown of Fintray	Yellow Turnips
Formartine	William Milne, West Craig	Turnips
	William Barron, Balnakettle	Potatoes
Garioch	John Tait, Crichie	Swedish Turnips
	William Philip, Lofthillock	Yellow Turnips
Inverurie	James Argo, Cairdseat	Polled Bull
	Alexander F. Nares, Brucktor	Shorthorn Bull
Kinellar	William Findlay, Mill of Fintray	Garden
	William Findlay, Mill of Fintray	Pen of Poultry
Lochel Cushnie	Alexander Middleton, Waukmill	Polled Bull
	James Strachan, Wester Fowlis	Polled Cow
New Aberdour	William Beedie, Pitgair	Polled Bull
	James Brown, Braco	Shorthorn Cow
	Alexander Whyte, South Whitewell	Brood Mare
	Alexander Lovie, Towie	Collection of Seeds
	Alexander Pittendrigh, Glaslaw	Collection of Roots
Vale of Alford	Joseph Brown, Little Endovie	Swedish Turnips
	William Yool, Glenlogie	Yellow Turnips

Argyllshire.

Lismore	Donald M'Coll, Bailenagown	Highland Cow
	Dugald M'Intyre, Frackersaig	Draught Gelding

Ayrshire.

Ardrossan	Andrew Allan, Munnoch	Cheese
	Miss Isabella M'Donald Wallace, Middlepart	Cured Butter
Cumnock	James Gilmour, Orchardton	Ayrshire Bull
	James Murray, Muir	Ayrshire Cow
Dalry	Robert Kerr, High Linn	Ayrshire Bull
	William Craig, Cunningham	Ayrshire Cow
	William Craig, Cunningham	Ayrshire Cow
	W. & D. Paton, Hourat	Brood Mare
Dalrymple	William Anderson, Barneil	Ayrshire Heifer
	John Templeton, Carnochan	Draught Gelding
Darvel	Thomas Hood, Galston	Collection of Roots
	James White, Wraise	Sweet Milk Cheese
Dundonald	John Caldwell, Bogside	Ayrshire Bull
	John Caldwell, Bogside	Ayrshire Cow
	R. & W. Guthrie, Crossburn	Clydesdale Mare
Galston	Thomas Donald, Crosstree	Ayrshire Bull
	John Nisbet, Longgreen	Ayrshire Cow
	James Picken, Laigh Langside	Clydesdale Mare
Girvan	John Wilson, Dalfask	Ayrshire Bull
	Earl of Stair	Blackfaced Tup
Irvine	Archibald Fulton, Newhouse	Ayrshire Cow
	Robert Hutchison, Craigsland	Clydesdale Mare
Loudoun & Lanfine	William Hodge, Hillhouse	Ayrshire Bull
	Alexander Steel, Burnhead	Ayrshire Cow
	George Alston of Loudonhill	Clydesdale Mare
	John Stewart, Over Moor	Blackfaced Tup
Sorn	R. & P. Wardrop, Garlaff	Ayrshire Bull
	John Ritchie, Broadwood	Ayrshire Cow
	James Picken, Laigh Langside	Clydesdale Mare
	William Wallace, Auchenbrain	Pen of Poultry

NAME OF DISTRICT.	MEDAL AWARDED TO	FOR
	AYRSHIRE—	
Sorn and Dalgain	George M'Kerrow, Daldilkan	Ayrshire Bull
	Robert Brown, Dalgain	Ayrshire Cow
	James Baird, Blindburn	Clydesdale Mare
	Gavin Hamilton, Nethershields	Sweet Milk Cheese
	John Watson, Daldorch	Fences
Stewarton	Robert Muir, Gallowayford	Ayrshire Bull
	John Lindsay, Thornhill	Ayrshire Cow
Torrinton	Hugh Wilson, Carngillan	Ayrshire Cow
	William Speirs, Lochlea	Draught Mare
West Kilbride	William Dunlop, Fences	Ayrshire Bull
	James Caldwell, Blackshaw	Ayrshire Cow
	BANFFSHIRE.	
Spey, Avon, and Fiddochside	Sir George Macpherson Grant, Bart.	Polled Heifer
	George Smith Grant, Achorachan	Blackfaced Tup
	John Murray, Blairmain	Barley
	Charles Stuart, Tomintugle	Oats
	BERWICKSHIRE.	
Lammermoor	T. W. & W. Elliot, Harehead	Half-bred Ewes
	A. R. Haig, Quarryford	Half-bred Gimmers
	BUTESHIRE.	
Buteshire	James Duncan, Meikle Kilcattan	Ayrshire Cow
	John Simpson, St Colmac	Clydesdale Mare
	Archibald Lamont, Stuck	Blackfaced Tup
	DUMBARTONSHIRE.	
Cumbernauld	John Park, Mainhead	Ayrshire Bull
	John Park, Mainhead	Ayrshire Cow
	Thomas Chalmers, Walton	Draught Mare
Western District of Dumbartonshire	James Galbraith, Edentaggart	Blackfaced Tup
	John Macfarlan, Faslane	Blackfaced Ewe and Lamb
	DUMFRIESSHIRE.	
Annandale	James Graham, Parcelstown	Galloway Bull
	Williamson & M'Crone, Castlemilk	Ayrshire Bull
	John Johnstone of Halleaths	Shorthorn Heifer
	Thomas Lawrie, Shieldhill	Cross-bred Hoggs
Sanquhar	Duke of Buccleuch	Ayrshire Bull
	Duke of Buccleuch	Ayrshire Cow
	Samuel Irving, Carco	Brood Mare
	D. C. Willison, Dalpeddar	Cheviot Tup
	James Moffat, Gateside	Blackfaced Tup
	EDINBURGHSHIRE.	
Western District of Mid-Lothian	Alexander Clerkson, Lyden	Ayrshire Bull
	John Meikle, Seafield	Ayrshire Cow
	Alexander Clerkson, Lyden	Clydesdale Colt
	John Waddell of Easter Inch	Clydesdale Mare
	FIFESHIRE.	
Woodgates	Alexander Gibb, Auchmuty	Brood Mare
	John Balfour of Balbirnie	Leicester Tup
	INVERNESS-SHIRE.	
Glen Urquhart	Dr Robert Craig, Kilmichal	Sandy Oats

NAME OF DISTRICT.	MEDAL AWARDED TO	FOR
	INVERNESS-SHIRE—*continued.*	
Northern Counties Pet Show	Lord Lovat	Cross Ox
	George T. Irvine, Nigg	Cross Heifer
	Lord Lovat	Cheviot Wethers
	Duncan Forbes of Culloden	Pigs
	Earl of Seafield, Balmacaan	Regent Potatoes
	Lady Mackenzie of Gairloch	Poultry
Stratiglass	George M'Kenzie, Balmore	Sandy Oats
	Roderick M'Rae, Erchless Mains	Fine-fellow Oats
	KINCARDINESHIRE.	
Fettercairn	William Brown, Pitnamoon	Shorthorn Bull
	Sir Thomas Gladstone of Fasque, Bart.	Brood Mare
	LANARKSHIRE.	
Cadder	James Johnstone, Lochburnie	Clydesdale Stallion
	James Johnstone, Lochburnie	Clydesdale Mare
Carnwath	Thomas Brown, Easton	Ayrshire Bull
	Robert Black, Bankhead	Draught Filly
	James M'Culloch, Forthley	Leicester Tup
	Thomas Shaw, Anston	Blackfaced Tup
Carmichael	Robert Thorburn, Stonehill	Blackfaced Tup
	William Muir, Eastersills	Leicester Tup
Stonehouse	Robert Lohoar, Dykehead	Ayrshire Bull
	John Letham, East Mains	Ayrshire Cow
	ORKNEY.	
Rousay	John Gibson, Sketquoy	Cow
	Colonel Burroughs of Rousay, C.B	Farm Management
	PERTHSHIRE.	
Culross	William Beveridge, East Grange	Farm Management
	William Beveridge, East Grange	Turnips
	John Kerr, North Pitdinnie	Hay
M. Dist. of Athole and Tullymet	Mrs M'Donald, Balnaguard	Green Crop
	RENFREWSHIRE.	
Eaglesham	Alexander Young, Castlehill	Draught Gelding
Neilston	Robert Gillespie, Boylestone	Ayrshire Bull
	John Holm, Jaapston	Ayrshire Cow
	ROSS-SHIRE.	
Black Isle	James Fletcher of Rosehaugh	Shorthorn Bull
	Colin Munro, Weston	Clydesdale Stallion
	A. Cameron, Artafallie	Leicester Tup
Wester Ross	Sir Kenneth S. Mackenzie of Gairloch, Bart.	Shorthorn Bull
	John Stirling of Fairburn	Draught Mare
	David G. Fleming, Ardullie	Chevalier Barley
	Mrs Reid of Balconie	Rye Grass
	STIRLINGSHIRE.	
Bucklyvie and Gartmore	Charles Stewart, Gateside	Ayrshire Cow
	John M'Keich, Ballaird	Brood Mare
Campsie, Strathblane and Baldernock	Robert Buchanan, Blairquhosh	Ayrshire Bull
	Gilbert Filshie, Bencloich	Clydesdale Mare
Gargunnock	James Sands, Greenfoot	Ayrshire Bull
	William Thomson, Nyaad	Clydesdale Mare

134 Medium Silver Medals, £70, 7s.

PLOUGHING COMPETITIONS.

In 1878–79 the Society's Silver Medal was awarded at 100 Ploughing Competitions as follows:—

ABERDEENSHIRE.

NO.	NAME OF SOCIETY.	PLACE OF COMPETITION.	SILVER MEDAL AWARDED TO
1.	Aberdour.	Nether Mill.	Alex. Penny, Towie
2.	Buchan (Deer District).	Aden.	James Gray, Mickle Dens.
3.	Buchan (Fraserburgh District).	Mains of Park.	Wm. Lawrance, Blackhills.
4.	Castleton.	Braemar.	Samuel Craigie, Braemar.
5.	Corgarff.	Dykehead.	George Dunbar, Belneiden.
6.	Crathie.	Wester Micras.	Alex. M'Intosh, Lawsie.
7.	Leochel Cushnie.	Enninteer.	Wm. M'Gregor, Craigmill.
8.	Lumphanan.	Auchinhove.	Geo. Leslie, Mill of Kintocher.
9.	Mar.	Mains of Skene.	Alex. Leiper, Bogiehill.
10.	North-East Aberdeenshire.	Overtown.	John Strachan, Merryhillock.
11.	Strichen.	Clayfords.	Andrew Quirrie, Auchtygills.

ARGYLLSHIRE.

12.	Ardnamurchan.	Swardle.	Malcolm M'Millan, Achosnich.
13.	Duror.	North Cuil.	Donald Connel, Ardsheal.
14.	Inveraray.	Inveraray.	John M'Allister, Minard.
15.	Islay, Jura, and Colonsay.	Scarrabus.	Robert M'Lellan, Scarrabus.
16.	Kilfinan.	Point.	John Duncan, Stealig.
17.	Killean and Kilcalmonell.	Tayinloan.	Charles M'Kinven, Auchindrian.
18.	Lismore.	Auchnacroich.	Arch. Black, Baileveolan.
19.	Lorn.	Balure.	Hugh M'Arthur, Keil.
20.	Nether Lorn.	Ardincaple.	Donald M'Innes, Clachan.
21.	Salen.	Callachally.	John M'Phail, Oskamull.

AYRSHIRE.

22.	Kirkmichael.	Balsaggart.	James Eccles, Barneil.
23.	New Cumnock.	Rigghead.	David Paterson, Faiglem.
24.	Sorn and Dalgain.	Daldorch.	Francis Weir, Blackside.
25.	Tarbolton.	Smithfield.	George Shankland, Benston.

BANFFSHIRE.

26.	Boharm.	Holl.	John Scott, Cullyshangan.
27.	Strathaven.	St Bridget.	James Riach, Findran.

BUTE AND ARRAN.

28.	Arran.	Glencloy.	Daniel M'Donald, West Bennan.
29.	Bute.	Gortans.	Arch. MacMillan, Knockanreoch.

CLACKMANNANSHIRE.

30.	Clackmannanshire Union.	Park.	James Reid, Harvestown.

DUMBARTONSHIRE.

31.	Kilmaronock and Bonhill.	Woodside.	Robert M'Kellar, Blairlusk.

ELGINSHIRE.

32.	St Andrews Lhanbryd.	Calcotts.	George Grant, Muirton.
33.	Urquhart.	Woodside of Leuchars.	Alex. Sandieson, Lochhill.
34.	Western District of Elgin.	Wester Manbeen.	Alex. Fraser, Manbeen.

FIFESHIRE.

35.	Howe of Fife.	Balmalcolm.	John Lawson, Pitlessie Mill.
36.	Largo.	Balmain.	David Steel, Windygates.
37.	Leslie.	Pitkevy.	Alex. Farmer, Bogside.
38.	North of Fife.	Creich.	John Thomson, Thornton.

FORFARSHIRE.

NO.	NAME OF SOCIETY.	PLACE OF COMPETITION.	SILVER MEDAL AWARDED TO
39.	Isla.	Campsie.	David Davidson, Inverquiech.
40.	Mains and Strathmartine.	West Kirkton.	Thomas Anderson, Magdalens.
41.	Tannadice and Oathlaw.	Finavon Haughs.	Alex. Gair, Nether Balgillo.

INVERNESS-SHIRE.

42.	Badenoch.	Kerrow.	Lachlan Macpherson, Kerrow.
43.	Glen Urquhart.	Borlum.	Rod. White, Drumbuie.
44.	Nether Lochaber.	North Ballachulish.	Alex. Anderson, Kinlochmore.
45.	Stratherrick	Garthbeg.	John M'Lean, Dell.
46.	Strathglass	Kerrow.	Kenneth Forsyth, Erchless.
47.	Strathnairn.	Leanach.	Alex. Munro, Nairnside.
48.	Strathspey.	Balliemore.	Donald M'Queen, Auchernack.
49.	Wester Strathnairn.	Knocknacronsaig.	Donald M'Gillivray, Tullich.

KINCARDINESHIRE.

50.	Durris.	Westerton.	Chas. MacHardy, Cairnfauld.
51.	Maryculter.	Millbank.	Joseph Middleton, Wetshaw.
52.	Portlethen.	Craighead.	Charles Murray, Blackhills.
53.	Rickarton, Urie, &c.	Rickarton.	William Moir, Blackburn.

STEWARTRY OF KIRKCUDBRIGHT.

54.	Kirkpatrick-Durham.	Knockwalloch.	John M'Cartney, Nether Yett.

LANARKSHIRE.

55.	Calderwaterhead.	Calderhead.	James Baillie, Whitecraighead.
56.	Dippel Water.	West Yett.	James Crawford, Rowantreehill.
57.	Hamilton, Blantyre, &c.	Stonefield.	James Ballantyne, Blantyre.
58.	New Monkland.	Burnfoot.	Robert Robb, Rochsolloch.
59.	Old Monkland.	Old Monkland.	William Muir, Mosside.

LINLITHGOWSHIRE.

60.	Blackburn.	Midseat.	James Neill, Torbanehill Mains.
61.	Kinneil.	Nether Kinneil.	George Strathie, Kinneil Mills.

NAIRNSHIRE.

62.	Ardclach.	Mid Flenas.	John M'Kinnon, Keppernach.
63.	Nairnshire.	Balblair.	James Mackay, Delnies.

ORKNEY.

64.	Egilshay.	Onziebust.	William Muir, Mainland.
65.	Evie and Rendall.	Burgar.	Henry Meil, Burgar.
66.	Orkney.	Barnhouse.	Wm. Groundwater, Swanbister.
67.	Orphir.	Swanbister.	Robert M'Kenzie, Hobbister.
68.	Rousay.	Saviskail.	David Marwick, Essaquoy.
69.	St Andrews.	Holland.	Robert Birse, Dalespot.
70.	St Ola.	Gaitnip.	Wm. Muir, Birstane.
71.	Shapinsay.	Strathore.	Wm. Craigie, Hollandsgarth.
72.	South Ronaldshay.	Smiddy Banks.	Edward Morquay, Widewall.
73.	Stronsay.	Huip.	James Morrison, Rothesholm.
74.	West Mainland.	How.	Peter Kirkness, Kierfiold.

PERTHSHIRE.

75.	Ardoch.	Gannochan.	Andrew Horn, Borland.
76.	Comrie and Upper Strathearn.	Drummondernoch.	James Crawford, Dunira.
77.	Culross.	Bath.	Henry Thomson, Muirhead.
78.	Dunblane.	Hungryhill.	Wm. Morrison, Corsecapelie.
79.	Foss and Strathtummel.	Foss Home Farm.	Dun. M'Gregor, Mains.
80.	Madderty (1875—duplicate).	Parkside.	James Ritchie, Littlefold.
81.	Mid. District of Athole, &c.	Guay.	Peter Scott, Balchandy.
82.	Monzievaird and Strowan.	Glascory.	Wm. R. M'Allum, Ballig.
83.	Moulin.	Ballyoukan.	John M'Beth, Knockbarrie.

NO.	NAME OF SOCIETY.	PLACE OF COMPETITION.	SILVER MEDAL AWARDED TO
84.	Port of Monteith.	Ballengrew.	Geo. Mitchell, West Third.
85.	Rannoch.	Aulich.	John Campbell, Camuserricht.
86.	St Martins.	Boghall.	Geo. Slidders, Townhead.
87.	Strathbraan.	Deanshaugh.	John M'Duff, Tonnagairn.
88.	Thornhill.	Spittalton.	Alex. M'Pherson, Stock o' Broom.
89.	Weem.	Castle Menzies.	John Menzies, Drumdewan.
		RENFREWSHIRE.	
90.	Cathcart and Eastwood.	Orchard.	Alex. Aikenhead, Lochinch.
91.	Erskine.	East Glenshinnoch.	John White, Fulwood.
92.	Greenock, Gourock, &c.	Ardgowan.	Wm. Broadfoot, Divert.
93.	Renfrewshire.	Arkleston.	John M'Neil, Barrangry.
		ROXBURGHSHIRE.	
94.	Lilliesleaf.	Hermiston.	Hector Stodart, Easter Lilliesleaf.
		STIRLINGSHIRE.	
95.	Craigforth and Touch.	Kaimes.	Jas. Stevenson, Redhall.
96.	Eastern Dist. of Stirlingshire.	Powfowlis.	Robert Buchanan, Inches.
		SUTHERLANDSHIRE.	
97.	Lairg and Gruids.	Lairg.	Alex. Gray, Culmaily.
		WIGTOWNSHIRE.	
98.	Machars.	Ravenstone Mains.	Sam. M'Clure, Backbraes.
99.	Old Luce.	Glenjoine.	Wm. M'Garvie, Culquhasen.
100.	Penninghame.	Balterson.	Wm. M'Connell, Balterson.

100 Minor Silver Medals, £30.

V. COTTAGES AND GARDENS.

1. BEST KEPT COTTAGES AND GARDENS.

			ABERDEENSHIRE.			
Methlick	Alex. Cheyne	Cottage	£1 and Minor Silver Medal	£1	6	0
	James Watt	do.		0	10	0
	John Milne	do.	Minor Silver Medal	0	6	0
	Peter Will	Garden	£1 and Minor Silver Medal	1	6	0
	Alex. Cheyne	do.		0	10	0
	William Ligertwood	do.	Minor Silver Medal	0	6	0
			EDINBURGHSHIRE.			
Calder's Union	James B. Smith	Cottage		1	0	0
	J. Weir (1st Prize in 1878)	do.	Minor Silver Medal	0	6	0
	Edward Blane	Garden	£1 and Minor Silver Medal	1	6	0
	James Weir	do.		0	10	0
	James B. Smith	do.	Minor Silver Medal	0	6	0
			FIFESHIRE.			
Newburgh	Robert Blyth	Cottage	£1 and Minor Silver Medal	1	6	0
	Charles Carswell	do.		0	10	0
	David Wilkie	do.	Minor Silver Medal	0	6	0
	Robert Nairn	Garden	£1 and Minor Silver Medal	1	6	0
	Charles Carswell	do.		0	10	0
	Isabella M'Donald	do.	Minor Silver Medal	0	6	0
North of Fife	James Scott	Cottage	£1 and Minor Silver Medal	1	6	0
	Joseph Seath	do.		0	10	0
	Alex. Rollan[illegible]	do.	Minor Silver Medal	0	6	0
			Carry forward,	£13	18	0

			Brought forward,	£13	18	0
N[illegible]	Alex. Rolland	Garden	£1 and Minor Silver Medal	1	6	0
	Robert Turnbull	do.		0	10	0
	James Maxwell	do.	Minor Silver Medal	0	6	0
	W. Leslie (1st Prize in 1878)	do.	Minor Silver Medal	0	6	0

KINCARDINESHIRE.

Mearn[illegible]	John Bruce	Cottage	£1 and Minor Silver Medal	1	6	0
	Mary Bell	do.		0	10	0
	Cream Anderson	do	Minor Silver Medal	0	6	0
	John Silver	Garden	£1 and Minor Silver Medal	1	6	0
	John Bruce	do.		0	10	0
	George Douglas	do.	Minor Silver Medal	0	6	0
	David Carnegie (1st Prize in 1878)	do.	Minor Silver Medal	0	6	0

LINLITHGOWSHIRE.

[illegible] and Queensferry	Mrs Morris	Cottage	£1 and Minor Silver Medal	1	6	0
	Mrs Myles	do.		0	10	0
	Mrs Marshall	do.	Minor Silver Medal	0	6	0
	Ben. Myles	Garden	£1 and Minor Silver Medal	1	6	0
	David Robertson	do.		0	10	0
	Henry Reid	do.	Minor Silver Medal	0	6	0

PERTHSHIRE.

[illegible]	John Dewar	Cottage	£1 and Minor Silver Medal	1	6	0
	Thomas Bayne	do.		0	10	0
	Donald M'Donald	do.	Minor Silver Medal	0	6	0
	Thomas Marshall (1st Prize in 1878)	do.	Minor Silver Medal	0	6	0
	Thomas Bayne	Garden	£1 and Minor Silver Medal	1	6	0
	Thomas Marshall	do.		0	10	0
	Arch. Bennett	do.	Minor Silver Medal	0	6	0
	David Monteath (1st Prize in 1878)	do.	Minor Silver Medal	0	6	0
[illegible]	Mrs M'Culloch	Cottage	£1 and Minor Silver Medal	1	6	0
	Mrs Winders	do.		0	10	0
	Arch. Fore	do.	Minor Silver Medal	0	6	0
	James M'Culloch	Garden	£1 and Minor Silver Medal	1	6	0
	David Young	do.		0	10	0
	Arch. Fore	do.	Minor Silver Medal	0	6	0
Methv[illegible]	James Maxton	Cottage	£1 and Minor Silver Medal	1	6	0
	Daniel Jolly	do.		0	10	0
	Miss L. Bayne	do.	Minor Silver Medal	0	6	0
	John Lumsden	Garden	£1 and Minor Silver Medal	1	6	0
	John Kevon	do.		0	10	0
	Andrew Gowans	do.	Minor Silver Medal	0	6	0

STIRLINGSHIRE.

K[illegible]	Robert King	Cottage	£1 and Minor Silver Medal	1	6	0
	George Bauchop	do.		0	10	0
	Walter M'Feat	do.	Minor Silver Medal	0	6	0
	James M'Nicol	Garden	£1 and Minor Silver Medal	1	6	0
	Mrs Robb	do		0	10	0
	William Pearson	do.	Minor Silver Medal	0	6	0

SUTHERLANDSHIRE.

Skibo	Mrs Forsyth	Cottage		1	0	0
	Donald Ross	do.		0	10	0
	Mrs M'Intosh	Garden	£1 and Minor Silver Medal	1	6	0
	Robert Gordon	do.		0	10	0
	Mrs Forsyth	do.	Minor Silver Medal	0	6	0
	Carry forward,			£46	0	0

			Brought forward,	£46	0	0
		WIGTOWNSHIRE.				
Inch	William Martin	Cottage	£1 and Minor Silver Medal	1	6	0
	Thomas Jess	do.		0	10	0
	Alexander M'Clymont	do.	Minor Silver Medal	0	6	0
	Thomas Brown	Garden	£1 and Minor Silver Medal	1	6	0
	John Carrol	do.		0	10	0
	Lawrence Donnelly	do.	Minor Silver Medal	0	6	0
				£50	4	0

2. MEDALS FOR COTTAGES AND GARDENS AND GARDEN PRODUCE.

Medium Silver Medals were awarded to the following:—

	AYRSHIRE.	
Stewarton	John Lindsay	Garden Produce
	DUMBARTONSHIRE.	
Vale of Leven and Dumbarton	Donald M'Lauchlan	Garden
	FIFESHIRE.	
Auchtermuchty and Strathmiglo	Alexander Pratt	Vegetables
	John H. Pennington	Garden
Dysart	Thomas Henderson	Garden
	Mrs W. Webster	Flower Plot
	INVERNESS-SHIRE.	
Badenoch and Rothiemurchus	Alexander Grant	Cottage
	Alexander Macpherson	Garden
	KINCARDINESHIRE.	
Fordoun, Glenbervie, and Arbuthnott	Edward Findlay	Flowers
	John Silver	Vegetables
	LANARKSHIRE.	
Albert Gardens	Alexander Muirhead	Best kept Plot
	James Boyd	Best Produce
Bothwell	James Hamilton	Cottage
	James Freebairn	Garden
Victoria Gardens	Mrs Watson	Best kept Plot
	George M. Oswald	Best kept Plot
Saracen Gardens	Robert Grant	Garden Produce
	Robert Grant	Best kept Plot
	PERTHSHIRE.	
Breadalbane, Weem, &c.	David Watson	Garden
Logiealmond and Glenalmond	James M'Ainsh	Cottage
	Alexander Philp	Garden

21 Medium Silver Medals, £11, 0s. 6d.

VI.—VETERINARY DEPARTMENT.

ANNUAL EXAMINATION—APRIL 1879.

Charles Rutherford, Edinburgh,	General Examination,	Med. Gold Medal,	£6 2 0

CLASS EXAMINATIONS—APRIL 1879.

Edinburgh Veterinary College.

Charles Rutherford, Edinburgh,	Anatomy,	Silver Medal,	0 16 0
Charles Rutherford, Edinburgh,	Physiology,	Silver Medal,	0 16 0
Charles Rutherford, Edinburgh.	Chemistry,	Silver Medal,	0 16 0
Charles Rutherford, Edinburgh,	Materia Medica.	Silver Medal,	0 16 0
George Mitchell, Prestonkirk.	Botany,	Silver Medal,	0 16 0
Charles Rutherford, Edinburgh,	Horse Pathology,	Silver Medal,	0 16 0
George Mitchell, Prestonkirk,	Cattle Pathology,	Silver Medal,	0 16 0
Frank Watt, Kilmany,	Horse and Cattle Pathology, (Amateurs),	Silver Medal,	0 16 0

New Veterinary College, Edinburgh.

John Carr, Northumberland,	Horse Pathology,	Silver Medal,	0 16 0
James Ingram, Manchester,	Physiology,	Silver Medal,	0 16 0
William Woods, Wigan,	Chemistry,	Silver Medal,	0 16 0
J. W. Canty, Limerick,	Materia Medica,	Silver Medal,	0 16 0
A. M. Michaelis, Manchester,	Botany,	Silver Medal,	0 16 0
Edward Leach, Wigan,	Cattle Pathology,	Silver Medal,	0 16 0
J. J. Fraser, Keith,	Anatomy,	Silver Medal,	0 16 0

Glasgow Veterinary College.

John Hamilton, Bothwell,	Horse Pathology,	Silver Medal,	0 16 0
John Hamilton, Bothwell,	Cattle Pathology,	Silver Medal,	0 16 0
Harry Mountney, Hill,	Physiology,	Silver Medal,	0 16 0
William Stevenson, Howood,	Anatomy,	Silver Medal,	0 16 0

Summer Session, 1878.

James Wyper, Glasgow,	Chemistry,	Silver Medal,	0 16 0
Allen Blue, Mearns,	Botany,	Silver Medal,	0 16 0
Harry Mountney, Hill,	Materia Medica,	Silver Medal,	0 16 0

Summer Session, 1879.

Henry Rogers, Bombay,	Chemistry,	Silver Medal,	0 16 0
John Taylor, Cathkin,	Botany,	Silver Medal,	0 16 0
Robert Roberts, Colwyn,	Materia Medica,	Silver Medal,	0 16 0
			£26 2 0

VII.—AGRICULTURAL CLASS, EDINBURGH UNIVERSITY.

1.	William Martin, Dumfriesshire,	£6 0 0
2.	Robert Menzies Traill, Orkney, and R. M. Malloch, Perthshire, equal, £2 each.	4 0 0
		£10 0 0

ABSTRACT OF PREMIUMS.

1. Essays and Reports,				£153	1 0
2. Dumfries Show, 1878,				14	17 0
3. Perth Show, 1879,				2529	19 6
4. District Shows:—					
Stock,	£667	4 6			
Special Grants,	82	0 0			
Local Societies—Medals in aid of Premiums given by (134),	70	7 0			
Ploughing Associations—Medals to (100),	30	0 0			
				849	11 6
5. Cottages and Gardens—Money Premiums and 49 Minor Silver Medals, £50, 4s.; 21 Medium Silver Medals, £11, 0s. 6d.				61	4 6
6. Veterinary Department—Medals to Students,				26	2 0
7. Agricultural Chair, Edinburgh University—Prizes to Class,				10	0 0
				£3644	15 6

STATE OF THE FUNDS

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY,

At 30th NOVEMBER 1879.

I.	BONDS—				
	Heritable Bonds,			£16,779 16	0
	Debenture Bond by Clyde Navigation Trustees,			3,000 0	0
	Railway Debenture Bonds,			4,450 0	0
				£24,229 16	0
II.	DEBENTURE STOCK—				
	£3,000 North British Railway Co., 4¼ per cent., at £104, 17s. 6d.,	£3,146 5 0			
	£1,000 London and North-Western Railway Co., 4 per cent., at £109,	1,090 0 0			
				4,236 5	0
III.	BANK STOCKS—				
	£6,407, 7s. 8d. Royal Bank of Scotland, at £203,	£13,006 19 9			
	2,218, 6s. 5d. Bank of England, at £269,	5,967 5 10			
	2,000, 0s. 0d. British Linen Company Bank, at £273,	5,460 0 0			
	1,250, 0s. 0d. National Bank of Scotland, at £260,	3,250 0 0			
	1,062, 10s. 0d. Commercial Bank of Scotland, at £236½,	2,512 16 3			
	1,091, 13s. 4d. Bank of Scotland, at £278,	3,034 16 8			
	£14,029, 17s. 5d.			33,231 18	6

Note.—The original cost of these Bank Stocks was £22,317, 18s. 6d., showing a profit, at present prices, of £10,914.

IV.	TEN SHARES (£500) OF THE BRITISH FISHERY SOCIETY, valued at		200 0	0
V.	ARREARS OF MEMBERS' SUBSCRIPTIONS, CONSIDERED RECOVERABLE,		83 7	6
VI.	BALANCE OF DEPOSITS WITH CITY OF GLASGOW BANK (in liquidation),		303 10	3
VII.	DEPOSIT WITH ROYAL BANK, 25th June 1879,		300 0	0
VIII.	BALANCE ON CURRENT ACCOUNT WITH ROYAL BANK,		662 2	0
	AMOUNT OF FUNDS,		£63,246 19	3
IX.	BUILDING FUND—			
	1. Estimated Value of Buildings, No. 3 George IV. Bridge,		£3,100 0	0
	2. Sums Invested in Debenture Bonds—			
	North British Railway Company,	£1,000 0 0		
	Clyde Navigation Trustees,	1,000 0 0		
			2,000 0	0
	3. Sum Lent on Heritable Bond,		350 0	0
	4. Deposit with Royal Bank, 11th November 1879,		22 13	0
	AMOUNT OF BUILDING FUND,		£5,472 13	0
X.	TWEEDDALE MEDAL FUND—			
	Deposit with Royal Bank, 20th November 1879,		£500 0	0
XI.	FURNITURE—			
	Estimated Value of Furniture, Paintings, Books, &c.,		£1,000 0	0

W. S. WALKER, *Treasurer.*
ANTHONY MURRAY, *Convener of Finance Committee.*
MACKENZIE & SMITH, C.A., *Auditors.*

EDINBURGH, *7th January* 1880.

ABSTRACT of the ACCOUNTS of the HIGHLAND and

CHARGE.

1.	BALANCE due by Royal Bank of Scotland on Account Current at 30th November 1878,						£37	12 5
2.	DEPOSITS with City of Glasgow Bank (in liquidation),			£897	2	3		
	Add Interest to date of Liquidation,			13	8	5		
							910	10 8
3.	DEPOSIT with Royal Bank of Scotland in name of the Building Fund, of date 11th November 1878,						287	5
4.	ARREARS of Annual Subscriptions at 30th November 1878, as in last year's Abstract,			£71	6	0		
	Whereof due by Members who have since *compounded* for life, and thereby extinguished,	£2	10 0					
	Sum ordered to be written off as irrecoverable,	23	10 6					
				26	0	6		
							45	5 6
5.	ARREARS from Dumfries Show, 1878,						117	17 9
6.	INCOME FROM INVESTMENTS—							
	(1.) Interest on Heritable Bonds—							
	On £1,300 at 4½ per cent., £58, 10s., less tax £1, 4s. 4d.,			£57	5	8		
	On £14,979, 16s. at 4 per cent., £599, 3s. 8d., less tax £12, 9s. 8d.,			586	14	0		
	£16,279, 16s.			£643	19	8		
	(2.) Interest on Debenture Bonds—							
	On £7,950 at 4 per cent., £318, less tax £6, 12s. 6d.,			311	7	6		
	(3.) Interest on Debenture Stock—							
	On £3000, at 4¼ per cent., £127, 10s., less tax £2, 13s. 2d.,		£124 16 10					
	On £1,000 at 4 per cent., £40, less tax 16s. 8d.,		39 3 4					
				164	0	2		
	(4.) Interest on Bank Account,			4	1	0		
				£1,123	8	4		
	(5.) Dividends on Bank Stocks—							
	On £6,407 7 8 Royal Bank of Scotland,		£608 14 0					
	2,218 6 5 Bank of England,		232 19 5					
	2,000 0 0 British Linen Co. Bank,		270 0 0					
	1,250 0 0 National Bank of Scotland,		187 10 0					
	1,062 10 0 Commercial Bank of Scotland,		138 2 6					
	1,091 13 4 Bank of Scotland,		141 18 4					
	£14,029 17 5			1,579	4	3		
	(6.) Dividend on £500 Stock of the British Fishery Society,			0	0	0		
	Note.—No dividend has been received on this Stock for the last six years.						2,702	12 7
7.	INCOME from Building Fund—							
	Interest on £1000 North British Railway Company Debenture Bond, at 4 per cent., £40, less tax 16s. 8d.,			£39	3	4		
	Interest on £1000 Clyde Navigation Trustees' Bond, at 4 per cent., £40, less tax 16s. 8d.,			39	3	4		
	Interest on Deposits with Royal Bank,			7	0	9		
							85	7 5
8.	SUBSCRIPTIONS—							
	Annual Subscriptions,			£888	18	6		
	Life Subscriptions,			658	9	0		
							1,547	7 6
	Carry forward,						£5,738	19 5

AGRICULTURAL SOCIETY of SCOTLAND for the YEAR 1878-79.

DISCHARGE.

1. ESTABLISHMENT EXPENSES—						
Salary to Secretary,					£850	0 0
Salary to Clerk, £300; Second Clerk, £150,					450	0 0
Messenger, £72; allowance to Widow of former Messenger, £21,					93	0 0
					£1,393	0 0
Feu-Duty, £28; Water Duty, £2, 3s. 4d.; Taxes, £34, 9s. 4d.,					64	12 8
Coals, £10, 15s. 2d.; Gas, £6, 5s. 5d.; Insurance, £3, 17s. 6d.,					20	18 1
Repairs and Furnishings,					46	0 4
					£1,524	11 1
2. FEE to Auditors for 1877-78 Accounts,					50	0 0
3. FEE to Practical Engineer,					20	0 0
4. AGRICULTURAL EDUCATION—						
Grant to Professor of Agriculture, £150; Prizes to Class, £10; Bursaries, £60; Fees to Examiners, and Expenses, £28,14s. 6d.,					248	14 6
5. CHEMICAL—						
Chemist's Salary, £300; and Travelling Expenses, &c., £21, 7s. 6d.,			£321	7 6		
Meteorological Instruments, £20; Lithographed Scheme of Experiments, £2,			22	0 0		
Experimental Stations—						
Harelaw—						
Rent, £30; Taxes, £1, 6s. 10d.; Superintendent's Allowance, £15, 15s.; Seed, £9, 12s. 2d.; Labour, £61, 7s. 4d.; Railway Carriage on Turnips Sold, Discount and Expenses of Sale, £25, 14s. 7d.; Repairs £4, 18s.,	£148 13 11					
Pumpherston—						
Rent, £13; Superintendent's Allowance, £15, 15s; Seed, £11, 5s. 4d., Manures, &c., £22, 17s. 5d.; Labour, £49, 19s.; Expenses of a Visit of Committee, £6, 19s.,	119 15 9					
			268	9 8		
			£611	17 2		
Donation to School of Chemistry and Agriculture, Aberdeen,			25	0 0		
					636	17 2
6. VETERINARY—Allowance to Professor Williams, £26, 5s.; Medals to Students, £26, 2s.; Fees to Examiners, £30,					82	7 0
7. TRANSACTIONS—Printing, Binding, and Delivering, £416, 19s.; Essays and Reports, £91, 18s.,					508	17 0
8. ORDINARY Printing and Lithographing, £72, 10s.; Advertising, £49, 7s. 8d.; Stationery and Books, £65, 7s. 10d.; Stamps, £47; Bank Charges, Telegrams, &c., £6, 8s. 11d.,					240	14 5
9. SUBSCRIPTIONS TO PUBLIC SOCIETIES—Meteorological Society, £20; Society for Prevention of Cruelty to Animals, £5,					25	0 0
10. MISCELLANEOUS—Reporting General Meeting, £3, 3s.; Luncheon for Directors, £2, 5s.; Photographing Stallion, £1, 10s.; Handsels, £1, 4s. 6d.; Re-striking Medals, 3s. 6d.,					8	6 0
11. PREMIUMS—						
Dumfries Show, 1878,			£347	17 0		
Perth Show, 1879,			1,933	19 6		
District Competitions, 1878, £611, 11s.; Ploughing Competitions, 1878-79, £30, 6s.; Cottages and Gardens, 1878, £51, 10s. 6d.,			693	7 6		
Vote to Edinburgh Christmas Club, 1878, £50; Glasgow Agricultural Society, 1878, £50,			100	0 0		
					3,075	4 0
Carry forward,					£6,420	11 2

ABSTRACT of the ACCOUNTS of the HIGHLAND

	Charge brought forward, . .						£5,733	19 5
9.	CHEMICAL—							
	Subscriptions, ...				£36	0 0		
	Experimental Stations—Receipts for Crops Sold—							
	Harelaw—							
	Turnip Crop, 1878, . .		£115	18 11				
	Barley Crop, 1879, . .		103	18 0				
			£219	16 11				
	Pumpherston—							
	Turnip Crop, 1878,	£30 11 4						
	Barley Crop, 1878,	2 5 6						
	Barley Crop, 1879,	60 15 0						
			93	11 10				
					313	8 9		
							349	8 9
10.	TRANSACTIONS —							
	Sales by Messrs Blackwood, ...						30	0 0
11.	GARDEN COMPETITIONS—							
	Donation from Albert Gardens' Association, . . .						1	1 0
12.	SUM received from The Most Noble William, Marquis of Tweeddale, for "Tweeddale Medal," £500, and interest thereon for two years, £40, less one year included in Perth Show accounts, £20, .						520	0 0
13.	CAPITAL PAID UP—							
	Caledonian Railway Co. Debenture Bond, . . .						500	0 0
14.	BALANCE of Receipts from Perth Show (exclusive of Premiums paid), *as shown in separate States*, ...						2,193	16 5
	SUM OF CHARGE, . .						£9,328	5 7

EDINBURGH, *7th January* 1880.

ABSTRACT OF ACCOUNTS—

CHARGE.

1.	LOCAL SUBSCRIPTIONS—							
	1. Eastern Division of Perthshire—Voluntary Assessment on Proprietors, ...						£411	18 0
	2. Western Division of Forfarshire,	do.	do. .				300	0 0
	3. Fifeshire,	do.	do. .				257	11 2
	4. Kinross-shire,	do.	do. .				46	1 0
							£1015	10 2
2.	AMOUNT COLLECTED DURING SHOW—							
	Drawn at Gates, . . .	£2,613	5 0					
	Drawn at Horse Ring and Cattle Parade,	197	1 6					
	Catalogues and Awards sold, . .	244	5 0					
	Drawn at Left Luggage Room, &c., .	8	8 10					
							3,063	0 4
3.	RENT OF STALLS, ...						1,498	12 0
4.	RENT OF REFRESHMENT BOOTHS, ...						216	0 0
5.	MANURE IN SHOW-YARD SOLD, ...						10	0 0
6.	FORFEITED DEPOSIT MONEY FOR RETURN OF HORSE, .						2	0 0
7.	INTEREST FROM ROYAL BANK, ...						14	8 10
8.	INTEREST ON £500 FOR YEAR AT 4 PER CENT. IN PAYMENT OF TWEEDDALE MEDAL, ...						20	0 0
							£5,839	11 4

NOTE.—The Premiums undrawn at 30th November 1879 amount to .	£596	0	0
From which deduct the above Balance of . . .	259	16	11
Making the probable Deficiency,	£336	3	1

and AGRICULTURAL SOCIETY of SCOTLAND—*continued.*

	Discharge brought forward, . . .	£6,420	11 2
12.	Expenses of Deputation to Kilburn Show—Secretary, £27; Dr Aitken, £20; Thomas Mylne, £15; Charles Smith, £15, .	77	0 0
13.	Business account to Murray & Falconer, W.S., for opinion of Council in regard to liability of Members for Bank Shares, .	55	18 0
14.	Payments in connection with former Shows—Aberdeen, 1876. Outlays by Mr Alexander Yeats, ...	8	6 2
15.	Arrears of Subscriptions to be struck off as irrecoverable,	44	17 6
16.	Arrears of Subscriptions considered recoverable, .	83	7 6
17.	Capital Sum lent on Heritable Bond, ...	500	0 0
18.	Capital Sum lent on Heritable Bond for Building Fund, .	350	0 0
19.	Deposited with Royal Bank for "Tweeddale Medal," 20th November 1879, ...	500	0 0
20.	Balance of Deposits with City of Glasgow Bank (in liquidation), .	303	10 3
21.	Deposited with Royal Bank, 25th June 1879, . . .	300	0 0
22.	Deposited with Royal Bank in name of Building Fund, 11th November 1879, ...	22	13 0
23.	Balance on Account Current with Royal Bank, at close of Accounts,	662	2 0
	Sum of Discharge, .	£9,328	5 7

W. S. WALKER, *Treasurer.*
ANTHONY MURRAY, *Convener of Finance Committee.*
MACKENZIE & SMITH, C.A., *Auditors.*

PERTH SHOW, 1879.

DISCHARGE.

1	Show-Yard Expenditure— Fitting up, £2108; Rent of South Inch, £25; Water Supply, £15, 7s. 2d.; Bogie for Crane, £13, 15s.; Fire Brigade, £11, 6s. 8d.; Miscellaneous, £4, 11s. 11d., .	£2178	0 9
2.	Forage and Bedding for Stock, ...	283	8 7
3.	Police Force, ...	63	0 0
4.	Travelling Expenses of Judges, &c., .	171	3 8
5.	Hotel and other Bills for Directors, Judges, Secretary, &c.,	309	2 1
6.	Tickets for President's Dinner for do., . . .	62	18 10
7.	Music in Show-Yard, &c., ...	44	3 1
8.	Printing Catalogues and Awards, and Lithographing Tickets, Badges, &c., ...	215	4 0
9.	Advertising and Posting Bills, ...	78	10 1
10.	Allowance to Local Secretary, ...	21	0 0
11.	Allowance to Practical Engineer, ...	18	18 0
12.	Allowance to Local Veterinary Inspectors, . .	10	0 0
13.	Assistants, Porters, and Attendants, . . .	151	3 6
14.	Postage and Receipt Stamps, . .	25	9 0
15.	Miscellaneous Outlays—Telegrams, Bank Charges, &c, .	1	7 7
16.	Expenses in connection with Stallion Competition at Perth in February 1879, ...	12	5 9
	Amount of General Expenses, . .	£3,645	14 11
17.	Premiums drawn at 30th November 1879, . . .	1,933	19 6
		£5,579	14 5
	Balance of Receipts, . .	259	16 11
		£5,839	11 4

W. S. WALKER, *Treasurer.*
ANTHONY MURRAY, *Convener of Finance Committee.*
MACKENZIE & SMITH, C.A., *Auditors.*

Edinburgh, *7th January* 1880.

ABSTRACT of the ACCOUNTS of the ARGYLL NAVAL FUND for 1878-79.

CHARGE.

1. FUNDS as at 30th November 1878—		
Debenture Bond by Caledonian Railway Company,		£1,000 0 0
Debenture Stock of the North British Railway Company,		1,200 0 0
Funded Debt of the Clyde Navigation Trust, £3000, purchased at		2,970 0 0
Stock of the Royal Bank, £305, purchased at		671 0 0
		£5,841 0 0
BALANCE in Bank at 30th November 1878,		71 19 10
		£5,912 19 10
2. INCOME received—		
On £1000 Caledonian Railway Company Debenture Bond at 4 per cent., £40, less tax, 16s. 8d.	£39 3 4	
On £1200 North British Railway Company Debenture Stock at 4¼ per cent., £51, less tax, £1, 1s. 4d.,	49 18 8	
On £3000 Funded Debt of Clyde Navigation Trust at 4 per cent., £120, less tax, £2, 10s.,	117 10 0	
On £305 Royal Bank Stock for year,	28 19 6	
On Bank Account.	1 7 6	
		236 18 6
SUM OF CHARGE,		£6,149 18 4

DISCHARGE.

1. ALLOWANCES to the two following Recipients—		
Norman Godfrey Macalister, fifth year,		£40 0 0
Charles Hope Dundas, first year,		40 0 0
		£80 0 0
2. FUNDS as at 30th November 1879—		
DEBENTURE BOND by Caledonian Railway Company,	£1,000 0 0	
DEBENTURE STOCK of the North British Railway Company,	1,200 0 0	
FUNDED DEBT of the Clyde Navigation Trust, £3000, purchased at	2,970 0 0	
STOCK of the Royal Bank, £305, purchased at	671 0 0	
	£5,841 0 0	
BALANCE in Bank at 30th November 1879,	228 18 4	
		6,069 18 4
SUM OF DISCHARGE,		£6,149 18 4

W. S. WALKER, *Treasurer.*
ANTHONY MURRAY, *Convener of Finance Committee.*
MACKENZIE & SMITH, C.A., *Auditors.*

EDINBURGH *7th January* 1880.

APPENDIX (B).

PREMIUMS

OFFERED BY

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND IN 1880.

CONTENTS.

PAGE

General Notice, ... 3
Constitution and Management, ... 4
Establishment, ... 5
Committees, ... 7
Agricultural Education, ... 10
Veterinary Department, ... 13
Forestry Department, ... 19
Chemical Department, ... 20
General Regulations for Competitors, ... 21

CLASS I.—REPORTS.

§ 1. The Science and Practice of Agriculture—For Approved Reports on—

1. Agriculture of the Counties of Forfar and Kincardine, . . 22
2. Agriculture of the Counties of Clackmannan and Kinross, . 22
3. Agriculture of Bute and Arran, ... 22
4. Agriculture of the County of Lanark, ... 22
5. Agriculture of the County of Stirling, ... 22
6. Unexhausted Value of Tile Drainage at termination of a Lease, . 23
7. Unexhausted Value of Lime at termination of a Lease, . . 23
8. Unexhausted Value of Manures and Feeding Stuffs at termination of a Lease, ... 23
9. Physiological Distinctions of the Scottish Peasantry, . . 23
10. Experiments for fixing the ingredients in Farm-yard Manure, . 23
11. Manures produced by different kinds of Feeding, . . . 23
12. Manure made with and without Cover, ... 24
13. Improved varieties of Agricultural Plants, . . . 24
14. Cultivation of Cabbage as a Field Crop, ... 24
15. Insects which prey upon Agricultural Plants, . . . 25
16. Vegetable Productions of India, China, and America, . . 25
17. Adulteration of Agricultural Seeds, ... 25
18. Grazing Cattle and Sheep together or separately, . . 25
19. Best mode of housing Fattening Cattle, ... 25
20. Different descriptions of Food for Stock, ... 26
21. Results of Feeding on quantity and quality of Butter and Cheese, 26
22. Border Leicester Breed of Sheep, ... 26
23. Breeding of Horses, and adaptability of soils to their Breeding and Rearing, ... 26

PAGE

24. Inoculation as a Prevention of Pleuro Pneumonia. . . 26
25. History, Nature, Symptoms, and Treatment of Sheep-Pox, . 27
26. Nature, Symptoms, Causes, and Treatment of Louping-Ill, . 27
27. Effect of Sewage upon the Animal System, . . . 27
28. Town Sewage, ... 27
29. Rural Economy abroad susceptible of being introduced into Scotland, 27

§ 2. Estate Improvements—For approved Reports on—

1. General Improvement of Estates by Proprietors, . . . 27
2. Most approved Farm Buildings by Proprietors, . . . 28
3, 4, and 5. Reclamation of Waste Land by Proprietors or Tenants, 28
6 and 7. Improvement of Natural Pasture by Proprietors or Tenants, 28

§ 3. Machinery—

Steam Reaper and Binder, ... 29
For approved Reports on—

1. Invention or Improvement of Implements of Husbandry, . 29
2. Cattle Truck for Feeding and Watering Animals in transit, . 29

§ 4. Forestry Department—For approved Reports on—

1. Extensive Planting by Proprietors, ... 29
2. Planting on Peat Bog, ... 30
3. Forest Trees of recent introduction, ... 30
4. The *Pinus Insignis*, ... 30
5. Trees best adapted for planting as shelter in the Islands of Scotland, 30
6. The old and remarkable Beeches in Scotland, . . . 30
7. The old and remarkable Oaks in Scotland, . . . 30
8. The Deterioration of Home-Grown Timber, . . . 31
9. The Cutting and Transport of Firewood (soft and hard), . . 31
10. Charcoal-producing Plants, ... 31
11. Perthshire Woods, Forests, and Forestry, . . . 31
12. Ross-shire Woods, Forests, and Forestry, . . . 31
13. Inverness-shire Woods, Forests, and Forestry, . . . 31
14. High Forest with Coppice, or Coppice with Standard Trees, . 31
15. Utilisation of Waste Produce of Forests for Artificial Fuel, . 31
16. Insects most injurious to Forest Trees, ... 32
17. Effects of the severe Frost of December 1879 on Trees and Shrubs, 32

CLASS II.—DISTRICT COMPETITIONS.

1. Cattle, ... 33
2. Horses, ... 34
3. Sheep, ... 36
4. Swine, ... 38
5. Dairy Produce, ... 38
6. Special Grants, ... 40
7. Medals in aid of the Premiums given by Local Societies, . . 40
8. Ploughing Competitions, ... 45

CLASS III.—COTTAGES AND GARDENS.

1. Premiums for Best Kept Cottages and Gardens, . . 46
2. Medals for Cottages and Gardens or Garden Produce, . 48
3. Improving Existing Cottages, ... 49
4. Building New Cottages, ... 49

GENERAL SHOW AT KELSO IN 1880, ... 51
GENERAL SHOW AT STIRLING IN 1881, ... 70
LIST OF MEMBERS ADMITTED SINCE JANUARY 1879, . . 74

GENERAL NOTICE.

THE HIGHLAND SOCIETY was instituted in the year 1784, and incorporated by Royal Charter in 1787. Its operation was at first limited to matters connected with the improvement of the Highlands of Scotland; but the supervision of certain departments, proper to that part of the country, having been subsequently committed to special Boards of Management, several of the earlier objects contemplated by the Society were abandoned, while the progress of agriculture led to the adoption of others of a more general character. The exertions of the Society were thus early extended to the whole of Scotland, and have, for the greater part of a century, been directed to the promotion of the science and practice of agriculture in all its branches.

In accordance with this more enlarged sphere of action, the original title of the Society was altered, under a Royal Charter, in 1834, to THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

The leading purposes of the Institution are set forth in the following pages, where it will be found that Premiums are offered for Reports on almost every subject connected with the cultivation of the soil; the rearing and feeding of stock; the management of the dairy; the improvement of agricultural machinery and implements; the growth of timber; the extension of cottage accommodation; the application of chemical science; and the dissemination of veterinary information.

Among the more important measures which have been effected by the Society are—

1. Agricultural Meetings and General Shows of Stock, Implements, &c., held in the principal towns of Scotland, at which exhibitors from all parts of the United Kingdom are allowed to compete.

2. A system of District Shows instituted for the purpose of improving the breeds of Stock most suitable for different parts of the country, and of aiding and directing the efforts of Local Agricultural Associations.

3. The encouragement of Agricultural Education, under powers conferred by a supplementary Royal Charter, granted in 1856, and authorising "The COUNCIL of the HIGHLAND AND AGRICULTURAL SOCIETY ON EDUCATION" to grant Diplomas to Students of Agriculture; and by the establishment of Bursaries.

4. The establishment of Agricultural Stations for the purpose of promoting the application of science to agriculture, and the appointment of a chemist to superintend all experiments conducted at these Stations, and prepare a Report of the same to be published in the Transactions.

5. The advancement of the Veterinary Art, by conferring Certificates on Students who have passed through a prescribed curriculum, and who are found, by public examination, qualified to practise.

6. The appointment of a Board of Examiners, and the granting of First and Second Class Certificates in Forestry.

7. The annual publication of the Transactions, which comprehend the Prize-Reports, and reports of experiments, also an abstract of the business at Board and General Meetings, and other communications.

8. The management of a fund left by John, 5th Duke of Argyll (the original President of the Society), to assist young natives of the Highlands who enter Her Majesty's Navy.

CONSTITUTION AND MANAGEMENT.

The general business of THE HIGHLAND AND AGRICULTURAL SOCIETY is conducted under the sanction and control of a Royal Charter, which authorises the enactment of Bye-Laws. Business connected with Agricultural Education is conducted under the authority of a supplementary Royal Charter, also authorising the enactment of Bye-Laws.

The Office-Bearers consist of a President, Four Vice-Presidents, Thirty Ordinary and Ten Extraordinary Directors, a Treasurer, an Honorary and an Acting Secretary, an Auditor, and other Officers.

The Directors meet on the first Wednesday of each month from November to June; seven being a quorum. The proceedings of the Directors are reported to General Meetings of the Society, held in January and in June or July.

With reference to motions at General Meetings, Bye-Law No. 7 provides—"That at General Meetings of the Society no motion or proposal (except of mere form or courtesy) shall be submitted or entertained for immediate decision unless notice thereof has been given a week previously to the Board of Directors, without prejudice, however, to the competency of making such motion or proposal to the effect of its being remitted to the Directors for consideration, and thereafter being disposed of at a future General Meeting."

The Council on Education, under the Supplementary Charter, consists of Sixteen Members—Nine nominated by the Charter, and Seven elected by the Society. The Board of Examiners consists of Ten Members.

Candidates for admission to the Society must be proposed by a Member, and are elected at the half-yearly General Meetings in January and June or July. The ordinary subscription is £1, 3s. 6d. annually, which may be redeemed by one payment, varying, according to the number of previous annual payments, from £12, 12s. to £7, 1s. Proprietors farming the whole of their own lands, whose assessments on the Valuation Roll does not exceed £500 per annum, and all Tenant-Farmers, Office-Bearers of Local Agricultural Associations, Resident Agricultural Factors, Land Stewards, Foresters, Agricultural Implement Makers, and Veterinary Surgeons, none of them being also owners of land to an extent exceeding £500 per annum, are admitted on a subscription of 10s. annually, which may be redeemed by one payment, varying, according to the number of previous annual payments, from £5, 5s. to £3. According to the Charter, a Member who homologates his Election by paying his first subscription cannot retire until he has paid in annual subscriptions, or otherwise, an amount equivalent to a life composition. Members having candidates to propose are requested to state whether the candidate should be on the £1, 3s. 6d. or 10s. list.

Members of the Society receive the Transactions free on application to the Secretary, and are entitled to apply for District Premiums—to report Ploughing Matches for the Medal—to attend Shows free of charge, and to exhibit Stock at reduced rates.

Orders, payable at the Royal Bank of Scotland, Edinburgh, are issued by the Directors, in name of the parties in whose favour Premiums have been awarded.

All communications must be addressed to "FLETCHER NORTON MENZIES, Esq., Secretary of the Highland and Agricultural Society of Scotland, No. 3 GEORGE IV. BRIDGE, EDINBURGH."

ESTABLISHMENT FOR 1880.

President.

MOST NOBLE THE MARQUIS OF LOTHIAN, K.T., Newbattle Abbey, Dalkeith.

Vice-Presidents.

The EARL of HADDINGTON, Tyninghame, Prestonkirk.
The EARL of WEMYSS and MARCH, Gosford, Haddington.
LORD NAPIER and ETTRICK, K.T., Thirlestane Castle, Selkirk.
LORD REAY, Carolside, Earlston.

Ordinary Directors.

ADAM SMITH, Stevenson Mains, Haddington.
Sir GEORGE DOUGLAS CLERK of Penicuik, Bart., Penicuik.
Sir JAMES R. GIBSON MAITLAND of Clifton Hall, Bart., Craigend, Stirling.
THOMAS A. HOG of Newliston, Kirkliston.
ANTHONY MURRAY of Dollerie, 141 George Street, Edinburgh.
THOMAS MYLNE, Niddrie Mains, Liberton.
WILLIAM RITCHIE of Middleton, Gorebridge.
CHARLES SMITH, Whittinghame, Prestonkirk.
Major W. J. WAUCHOPE of Niddrie Marischal, Liberton.
Lord POLWARTH, Mertoun House, St Boswells.
JOHN H. DICKSON of Corstorphine, Saughton Mains, Edinburgh.
JAMES MAXTONE GRAHAM of Redgorton, Battleby, Perth.
JAMES HOPE, Dreddingston, Edinburgh.
JAMES KENNEDY of Sundaywell, Brandleys, Sanquhar.
CHARLES SCOTT PLUMMER of Sunderland Hall, Selkirk.
ANDREW RALSTON, Glamis House, Glamis.
Sir MICHAEL ROBT. SHAW STEWART of Blackhall, Bart., Ardgowan, Greenock.
Sir ALEXANDER MUIR MACKENZIE of Delvine, Bart., Dunkeld.
WILLIAM DINGWALL, Ramornie, Ladybank.
JOHN HENDRIE of Larbert, Stirlingshire.
HUGH KIRKWOOD, Killermont, Maryhill, Glasgow.
THOMAS ROSS, Bachilton, Perth.
Lord ARTHUR CECIL, Orchard Mains, Innerleithen.
Sir HEW DALRYMPLE of North Berwick, Bart., Luchie, North Berwick.
JAMES CUNNINGHAM, Tarbreoch, Dalbeattie.
JOHN SCOTT DUDGEON, Longnewton, St Boswells.
JOHN FORMAN, Duncrahill, 51 Great King Street, Edinburgh.
R. H. HARRIS, Earnhill, Forres.
WILLIAM ELIOTT LOCKHART of Borthwickbrae, Branxholme, Hawick.
DAVID R. WILLIAMSON of Lawers, Crieff.

Extraordinary Directors.

Lord Elcho, M.P., Gosford, Haddington.
Hon. Henry Constable Maxwell Stuart of Traquair, Innerleithen.
Sir Robert Hay of Haystoun, Bart., Kingsmeadows, Peebles.
Sir William Scott of Ancrum, Bart., Jedburgh.
Sir George H. Scott Douglas of Springwood Park, Bart., M.P., Kelso.
Sir Dudley Coutts Marjoribanks of Guisachan, Bart., M.P., Beauly.
David Milne Home of Milne Graden, Coldstream.
Colin J. Mackenzie of Portmore, Eddleston.
James Smith, Chief Magistrate, Kelso.
Archibald Campbell Swinton of Kimmerghame, Dunse.

Office-Bearers.

William Stuart Walker of Bowland, C.B., *Treasurer.*
Sir G. Graham Montgomery of Stanhope, Bart., M.P., *Honorary Secretary.*
Fletcher Norton Menzies, *Secretary.*
Rev. James Grant, D.C.L., D.D., *Chaplain.*
Andrew P. Aitken, Sc.D., *Chemist.*
Mackenzie & Smith, C.A., *Auditors.*
Murray & Falconer, W.S., *Law Agents.*
John Wilson, University of Edinburgh, *Professor of Agriculture.*
John Hutton Balfour, M.D., F.R.S., *Professor of Botany.*
David Stevenson, F.R.S.E., M.I.C.E., *Consulting Engineer.*
James D. Park, *Practical Engineer.*
Thomas Duncan, *Recorder and Clerk.*
John Macdiarmid, *Second Clerk.*
Gourlay Steell, R.S.A., *Animal Portrait Painter.*
William Williams, F.R.C.V.S., *Professor of Veterinary Surgery.*
Thomas Walley, M.R.C.V.S., *Professor of Cattle Pathology.*
William Blackwood & Sons, *Publishers.*
Neill & Company, *Printers.*
G. Waterston & Sons, *Stationers.*
Hamilton, Crichton, & Co., *Silversmiths.*
Alexander Kirkwood & Son, *Medallists.*
John Watherston & Sons, *Inspectors of Works.*
William Simpson, *Messenger.*

Chairman of Committees.

1.	*Argyll Naval Fund*, .	Admiral Maitland Dougall of Scotscraig, Tayport.
2.	*Chemical Department*, .	Colin J. Mackenzie of Portmore, Eddleston.
3.	*Cottages and Gardens*, .	Harry Maxwell Inglis of Loganbank.
4.	*District Shows*, . .	A. Campbell Swinton of Kimmerghame, Dunse.
5.	*Finance*, . . .	Anthony Murray of Dollerie.
6.	*General Shows*, . .	Andrew Gillon of Wallhouse, Bathgate.
7.	*Hall and Chambers*, .	John Ord Mackenzie of Dolphinton.
8.	*Law*, ...	Graham Binny, W.S., 9 Hart Street, Edinburgh.
9.	*Machinery*, . . .	Thomas Mylne, Niddrie Mains, Liberton.
10.	*Ordnance Survey*, .	Robert Dundas of Arniston, Gorebridge.
11.	*Publications and Premiums for Reports*,	Alexander Forbes Irvine of Drum.
12.	*Steam Cultivation*, .	The Marquis of Lothian, K.T.
13.	*Veterinary Department*,	Major Wauchope of Niddrie Marischal, Liberton.

COMMITTEES FOR 1880.

1. ARGYLL NAVAL FUND.

Admiral Maitland Dougall of Scotscraig, R.N., Tayport, *Convener.*
Graham Binny, W.S., 9 Hart Street, Edinburgh.
Hew Crichton, S.S.C., 13 Nelson Street, Edinburgh.

2. CHEMICAL DEPARTMENT.

C. J. Mackenzie of Portmore, Eddleston, *Convener.*
Professor Douglas Maclagan, 28 Heriot Row, Edinburgh.
,, Balfour, Inverleith House, Edinburgh.
,, Wilson, University, Edinburgh.
James Melvin, Bonnington, Ratho.
P. B. Swinton, Holyn Bank, Gifford.
Robert Hutchison of Carlowrie, 29 Chester Street, Edinburgh.
Bryden Monteith, Tower Mains, Liberton.
John Munro, Fairnington, Kelso.
Adam Smith, Stevenson Mains, Haddington.
Thomas Ferguson, Kinnochtry, Coupar-Angus.
James Cochrane, Waterside Lodge, Newburgh, Aberdeen.
Thomas Mylne, Niddrie Mains, Liberton.
William Ritchie of Middleton, Gorebridge.
Charles Smith, Whittinghame, Prestonkirk.
John Scott Dudgeon, Longnewton, St Boswells.
George R. Glendinning, Hatton Mains, Ratho.
Alex. R. Melvin, Bonnington, Ratho.
Dr Andrew P. Aitken, 3 George IV. Bridge, Edinburgh, *Chemist.*

3. COTTAGES AND GARDENS.

Harry Maxwell Inglis of Loganbank, *Convener.*
The Marquis of Huntly, Aboyne Castle, Aberdeen.
John Ord Mackenzie of Dolphinton.
Archibald Campbell Swinton of Kimmerghame, Duns.
C. J. Mackenzie of Portmore, Eddleston.
Major Wauchope of Niddrie Marischal, Liberton.

4. DISTRICT SHOWS.

Archibald Campbell Swinton of Kimmerghame, *Convener.*
The Hon. George Waldegrave Leslie, Leslie House, Leslie.
Sir George D. Clerk of Penicuik, Bart.
Sir Thomas Buchan Hepburn of Smeaton, Bart., Prestonkirk.
Sir James R. Gibson-Maitland of Clifton Hall, Bart., Craigend, Stirling.
Thomas Mylne, Niddrie Mains, Liberton.
Alexander Young, Keir Mains, Dunblane.
Andrew Mitchell, Alloa.
Charles Howatson of Dornel, Daldorch House, Mauchline.
Adam Smith, Stevenson Mains, Haddington.
James Hope, Duddingston, Edinburgh.
Hugh Kirkwood, Killermont, Maryhill, Glasgow.

5. FINANCE.

Anthony Murray of Dollerie, *Convener.*
William S. Walker of Bowland, C.B., *Treasurer.*
Sir G. Graham Montgomery of Stanhope, Bart., M.P.
Hew Crichton, S.S.C., 13 Nelson Street, Edinburgh.
Thomas A. Hog of Newliston, Kirkliston.
Graham Binny, W.S., 9 Hart Street, Edinburgh.
George Auldjo Jamieson, C.A., 58 Melville Street, Edinburgh.

6. GENERAL SHOWS.

ANDREW GILLON of Wallhouse, Bathgate, *Convener.*
Lord POLWARTH, Mertoun House, St Boswells.
Lord ARTHUR CECIL, Orchard Mains, Innerleithen.
The Hon. GEORGE WALDEGRAVE LESLIE, Leslie House, Leslie.
Sir MICHAEL R. SHAW-STEWART of Blackhall, Bart., Greenock.
DAVID STEVENSON, C.E., 84 George Street, Edinburgh.
Professor WILSON, University, Edinburgh.
THOMAS MYLNE, Niddrie Mains, Liberton.
ALEXANDER YOUNG, Keir Mains, Dunblane.
WILLIAM FORD, Hardengreen, Dalkeith.
ANDREW MITCHELL, Alloa.
CHARLES HOWATSON of Dornel, Daldorch House, Mauchline.
J. M. MARTIN, yr. of Auchendennan, Bloomhill, Cardross.
ALEXANDER FORBES IRVINE of Drum.
ROBERT COPLAND, Mill of Ardlethen, Ellon.
JAMES COCHRANE, Waterside Lodge, Newburgh, Aberdeen.
THOMAS FERGUSON, Kinnochtry, Coupar-Angus.
CHARLES SMITH, Whittinghame, Prestonkirk.
HUGH KIRKWOOD, Killermont, Maryhill.
DAVID R. WILLIAMSON of Lawers, Crieff.
JOHN H. DICKSON of Corstorphine, Saughton Mains, Edinburgh.
JOHN SCOTT DUDGEON, Longnewton, St Boswells.

7. HALL AND CHAMBERS.

JOHN ORD MACKENZIE of Dolphinton, *Convener.*
Sir JAMES GARDINER BAIRD of Saughton Hall, Bart.
ANTHONY MURRAY of Dollerie, 141 George Street, Edinburgh.
GRAHAM BINNY, W.S., 9 Hart Street, Edinburgh.
DAVID STEVENSON, C.E., 84 George Street, Edinburgh.
WILLIAM S. WALKER of Bowland, C.B.

8. LAW.

GRAHAM BINNY, W.S., Edinburgh, *Convener.*
JOHN ORD MACKENZIE of Dolphinton, W.S., Edinburgh.
WILLIAM S. WALKER of Bowland, C.B.
ANTHONY MURRAY of Dollerie, W.S., Edinburgh.
HEW CRICHTON, S.S.C., 13 Nelson Street, Edinburgh.
GEORGE AULDJO JAMIESON, C.A., 58 Melville Street, Edinburgh.
THOMAS GRAHAM MURRAY, W.S., 11 Randolph Crescent, Edinburgh.

9. MACHINERY.

THOMAS MYLNE, Niddrie Mains, *Convener.*
The Hon. GEORGE WALDEGRAVE LESLIE, Leslie House, Leslie.
Lord ARTHUR CECIL, Orchard Mains, Innerleithen.
Sir JAMES R. GIBSON-MAITLAND of Clifton Hall, Bart.
DAVID STEVENSON, C.E., 84 George Street, Edinburgh.
Professor WILSON, University, Edinburgh.
PATRICK SMALL KEIR of Kindrogan, Pitlochry.
JOHN MUNRO, Fairnington, Kelso.
P. B. SWINTON, Holyn Bank, Gifford.
C. J. MACKENZIE of Portmore, Eddleston.
ROBERT HUTCHISON of Carlowrie.
BRYDEN MONTEITH, Tower Mains, Liberton.
GEORGE ROBERTSON of Hedderwick, C.E., 47 Albany Street, Edinburgh.
G. W. MURRAY, Banff Foundry, Banff.
JOHN SCOTT DUDGEON, Longnewton, St Boswells.
JAMES ROSS, Newtonlees, Kelso.
JOHN KEMP, Stirling.

James A. R. Main, Hope Street, Glasgow.
John Marshall, Mayfield.
John Young, jun., Ayr.
James D. Park, Greenside Lane, Edinburgh, *Practical Engineer.*

10. ORDNANCE SURVEY.

Robert Dundas of Arniston, *Convener.*
C. J. Mackenzie of Portmore, Eddleston.
William S. Walker of Bowland, C.B.

11. PUBLICATIONS AND PREMIUMS FOR REPORTS.

Alexander Forbes Irvine of Drum, *Convener.*
Sir James R. Gibson-Maitland of Clifton Hall, Bart.
William S. Walker of Bowland, C.B.
Professor Balfour, Inverleith House, Edinburgh.
,, Wilson, University, Edinburgh.
Robert Scot Skirving, 29 Drummond Place, Edinburgh.
P. B. Swinton, Holyn Bank, Gifford.
Robert Hutchison of Carlowrie, 29 Chester Street, Edinburgh.
Thomas Mylne, Niddrie Mains, Liberton.
David Stevenson, C.E., 84 George Street, Edinburgh.
Dr Cleghorn of Stravithie, St Andrews.
William Elliott Lockhart of Borthwickbrae, Branxholme, Hawick.
Robert P. Newton of Castlandhill, Polmont Bank, Falkirk.
C. J. Mackenzie of Portmore, Eddleston.
Thomas A. Hog of Newliston, Kirkliston.
William Macdonald, Editor, *North British Agriculturist*, Edinburgh.

12. STEAM CULTIVATION.

The Marquis of Lothian, K.T., *Convener.*
Hon. George Waldegrave Leslie, Leslie House, Leslie.
Sir Thomas Buchan Hepburn of Smeaton, Bart., Prestonkirk.
David Stevenson, C.E., 84 George Street, Edinburgh.
Professor Wilson, University, Edinburgh.
Thomas Mylne, Niddrie Mains, Liberton.
P. B. Swinton, Holyn Bank, Gifford.
John Munro, Fairnington, Kelso.

13. VETERINARY DEPARTMENT.

Major Watchope of Niddrie Marischal, Liberton, *Convener.*
Sir Alexander Kinloch of Gilmerton, Bart., Drem.
Andrew Gillon of Wallhouse, Bathgate.
William S. Walker of Bowland, C.B.
Thomas Mylne, Niddrie Mains, Liberton.
Alexander M'Dougal, Granton Mains, Edinburgh.
Thomas A. Hog of Newliston, Kirkliston.
Adam Smith, Stevenson Mains, Haddington.
Hugh Kirkwood, Killermont.
David R. Williamson of Lawers, Crieff.

SPECIAL COMMITTEES.

1. *Entomological Specimens.*—Robert Scot Skirving, Edinburgh, *Convener*; Professor Wilson; Professor Sir C. Wyville Thomson; John Wilson, Wellmge, Dunse.

2. *Transit of Stock.*—Patrick Dudgeon of Cargen, Dumfries, *Convener*; Graham Binny, W.S.; Andrew Gillon of Wallhouse, Bathgate; Sir Alexander Kinloch of Gilmerton, Bart., Drem; R. P. Newton of Castlandhill; John Ord, of Over Whitton, Nisbet, Kelso; W. S. Walker of Bowland, C.B.; Archibald Campbell Swinton of Kimmerghame, Dunse; Alexander F. Irvine of Drum; David Milne Home of Milne Graden.

The President, Vice-Presidents, Treasurer, and Honorary Secretary, are members *ex officio* of all Committees.

AGRICULTURAL EDUCATION.

CERTIFICATES AND DIPLOMA IN AGRICULTURE.

Council on Education.

By a Supplementary Charter under the Great Seal, granted in 1856, the Society is empowered to grant Diplomas.

Members of Council named by Charter.

The President of the Highland and Agricultural Society—*President.*
The Lord Justice-General—*Vice-President.*

The Lord Advocate.
The Dean of Faculty.
The Professor of Agriculture.
The Professor of Anatomy.
The Professor of Botany.
The Professor of Chemistry.
The Professor of Natural History.

Members of Council nominated by Society.

The Duke of Buccleuch, K.G.
William S. Walker of Bowland, C.B.
John Wilson, Wellnage.
Thomas Mylne, Niddrie Mains.
Robert Dundas of Arniston.
John Munro, Fairnington.
A. Campbell Swinton of Kimmerghame.

Board of Examiners.

1. *Science and Practice of Agriculture.*—Professor Wilson; John Wilson, Wellnage, Dunse; Thomas Mylne, Niddrie Mains, Liberton; and John Munro, Fairnington, Kelso.
2. *Botany.*—Professor Balfour.
3. *Chemistry.*—Dr A. P. Aitken.
4. *Natural History.*—Professor Sir C. Wyville Thomson.
5. *Veterinary Science.*—Professor Williams.
6. *Field Engineering.*—David Stevenson, M. Inst. C.E.
7. *Book-keeping.*—Kenneth Mackenzie, C.A., and John Turnbull Smith, C.A.

Standing Acting Committee.

The Lord Justice-General—*Convener.*

The Professor of Agriculture.
The Professor of Botany
The Professor of Chemistry.
Thomas Mylne, Niddrie Mains.
John Munro, Fairnington.
A. Campbell Swinton of Kimmerghame.

Bye-Laws.

I. That, in terms of the Charter, the Society shall nominate seven members to act on the Council on Education.

II. That the Council shall appoint a Board of Examiners on the following subjects:—Science and Practice of Agriculture; Botany; Chemistry; Natural History; Veterinary Science; Field Engineering; and Book-keeping.

III. That the examinations shall be both written and oral, that the value of the answers shall be determined by numbers, and that the oral examinations shall be public.

IV. That there shall be three Examinations,* to be styled respectively the "Second Class Certificate Examination," the "First Class Certificate Examination," and the "Diploma Examination."

V. That to pass the "Second Class Certificate Examination," a candi-

* It has been resolved that, under ordinary circumstances, the Examinations shall be held annually in the end of March or beginning of April, candidates being required to lodge intimation before the 15th of March.

date must be acquainted with the science and practice of agriculture, elementary chemistry, field engineering, and book-keeping; and that a certificate in the following terms, bearing the corporate seal and arms of the Society, signed by the President or Vice-President of the Council on Education, the Examiners, and by the Secretary, shall be granted to candidates passing this examination :—

"These are to certify that on the A. B. was examined, and has been found to possess a knowledge of the science and practice of agriculture, elementary chemistry, field engineering, and book-keeping."

VI. That to pass the "First Class Certificate Examination" a candidate must be acquainted with the science and practice of agriculture, botany, chemistry, natural history, veterinary science, field engineering, and book-keeping; and that a certificate in the following terms, bearing the corporate seal and arms of the Society, signed by the President or Vice-President of the Council on Education, the Examiners, and by the Secretary, shall be granted to candidates passing this examination :—

"These are to certify that on the A. B. was examined, and has been found to possess a knowledge of the science and practice of agriculture, botany, chemistry, natural history, veterinary science, field engineering, and book-keeping."

VII. That to pass the "Diploma Examination" a candidate must possess a *thorough knowledge* of the science and practice of agriculture, botany, chemistry, natural history, veterinary science, field engineering, and book-keeping; and that a diploma in the following terms, bearing the corporate seal and arms of the Society, and signed by the President or Vice-President of the Council on Education, the Examiners, and by the Secretary, shall be granted to candidates passing this examination :—

"These are to certify that, on the A. B. was examined, and has been found to be proficient in the science and practice of agriculture, botany, chemistry, natural history, veterinary science, field engineering, and book-keeping."

VIII. That each successful candidate for the Society's Agricultural Diploma shall thereby become eligible to be elected a free life member of the Society.

IX. That the Society shall grant annually ten bursaries of £20 each: and five of £10 each, to be competed for by pupils of schools to be approved of by the Directors, which include or are willing to introduce the teaching of chemistry, and the following branches of natural science—physical geography, botany, and geology, into their curriculum.

X. That the £20 bursaries shall be tenable for one year at the University of Edinburgh, for the purpose of enabling the holders to take the classes necessary to qualify for the Society's Certificate or Diploma: and the £10 bursaries to be tenable for the same period to enable the holders to receive another year's preparation at the schools.

XI. That the bursaries shall be determined by examination held in Edinburgh by the Society's Examiners.

XII. That a Standing Acting Committee of the Council on Agricultural Education shall be appointed by the Directors.

SYLLABUS OF EXAMINATION

FOR CERTIFICATES AND DIPLOMA.

I.—SCIENCE AND PRACTICE OF AGRICULTURE.

1. Geological strata—surface geology—formation of soils—their classification—chemical and physical characters and composition—suitability for cultivation. 2. The principle of rotations—rotations suitable for different

soils—systems of farming. 3. The composition of (*a*) manures—farmyard and artificial—period and mode of application. The composition of (*b*) feeding substances—their suitability for different classes of farm stock—considerations affecting their use. 4. "How crops grow"—our farm crops—their cultivation—diseases—insect injuries and remedies—their chemical composition. The formation and management of plantations. 5. The principles on which drainage, irrigation, and warping operations should be based and carried out. The application of lime—marl—clay, &c. 6. Meteorology, or the laws of climate as affecting plant life—the influence of light and heat on cultivation—of absorption and retention of heat and moisture—of porosity and capillarity in soils. 8. The breeding, rearing, feeding, and general treatment of farm stock—the different breeds of cattle and sheep—their characteristics—the districts where they are generally met with. 9. The machines and implements used in farming—their uses—and the principal points to be attended to in their construction. The "prime movers," or sources of power used in agriculture—man—horse—wind—water—steam,—their relative values and advantages. *Text-books*—Morton's "Cyclopedia of Agriculture," Blackie & Son; "Our Farm Crops," Blackie & Son: "How Crops Grow," Macmillan & Co.; Roscoe's "Elementary Chemistry," Macmillan & Co.: Lindley's, Henfrey's, or Balfour's "Botany;" Page's "Geological Text-Book," Blackwood & Sons.

II.—BOTANY.

1. Nutritive Organs of Plants—root, stem, leaves. Functions of roots. Various kinds of stems, with examples. Use of the stem. Structure of leaves. Different kinds of leaves. Arrangement and functions of leaves. 2. Reproductive Organs—Flower and its parts. Arrangements of the whorls of the flower—calyx, corolla, stamens, pistil. Ovule. Mature pistil or fruit. Pruning and grafting. Seed. Young plant or embryo. Sprouting of the seed, or germination. 3. General Principles of Classification—meaning of the terms Class, Order, Genus, Species. Illustrations of natural orders taken from plants used in agriculture, such as grain-crops, grasses, clovers, vetches, turnips, mangold-wurzel, pease, beans, &c. Practical Examination in fresh Specimens and Models; some of the latter may be seen in the Museum, at the Royal Botanic Garden, which is open daily to the public, free. *Text-book*—Balfour's "Elements of Botany," A. & C. Black, 1876; price 3s. 6d.

III.—CHEMISTRY.

The general principles of chemical combination. The chemistry of the more commonly occurring elements, and their more important compounds. The chemical processes concerned in agriculture generally. The changes which take place in the germination, growth, and maturation of plants, in the weathering and manuring of soils, &c. The composition and chemical character of the common mineral manures. *Text-books*—Roscoe's "Lessons in Elementary Chemistry," Macmillan & Co., London: price 4s. 6d. Anderson's "Elements of Agricultural Chemistry." A. & C. Black, Edinburgh; price 6s. 6d. Johnson's "How Crops Grow," Macmillan & Co., London.

IV.—NATURAL HISTORY.

1. Zoology.

1. The Primary Divisions of the Animal Kingdom, with examples of each. 2. The Vertebrate Kingdom. The peculiarities and functions of the alimentary canal, distinguishing the Ruminants. 3. The Orders—Hymenoptera, Diptera, and Coleoptera—with examples of insects injurious to farm crops belonging to each of the Orders—the preservation of birds which prey upon these insects, drawing a distinction between those which are beneficial and those which are destructive to crops. Text-book—Nicholson's "Introductory Text-Book of Zoology," William Blackwood & Sons, Edinburgh and London.

2. Geology.

4. The various strata forming the earth's crust in their order of deposition. 5. Their influences on the surface soils of the country. 6. The meaning and application of Disintegration, Drift, Alluvium, Dip, Strike, Fault. Page's "Introductory Text-Book of Geology;" and Lyell's "Students' Elements of Geology."

V.—VETERINARY SCIENCE.

1. Anatomy of the digestive organs of horse and ox, describing their structural differences. 2. The process of digestion in the above animals, and food most proper for each in quantity and quality. 3. The management of stock before, at, and after parturition. The time of utero-gestation in the domesticated animals. 4. The general principles to be followed in the treatment of very acute disease, before assistance of the veterinary surgeon can be procured.

VI.—FIELD ENGINEERING.

1. Land-Surveying with the Chain. 2. Mensuration of Areas of Land, in imperial and Scotch acres, from a Chain Survey or from a Plan. 3. Levelling with the ordinary Levelling Instrument and Staff, and calculating levels and gradients. *Text-books*—Any one of the following:—Butler Williams' "Practical Geodesy," J. W. Parker, London; price 8s. 6d.; pages 1 to 19, 30 to 33, 56 to 59, 118 to 129. "Cassell on Land-Surveying," Cassell, Petter & Galpin, London; or "Bruff on Land-Surveying," Simpkin & Marshall, London; the parts which relate to chain-surveying and ordinary levelling only.

VII.—BOOK-KEEPING.

1. Questions in practice and proportion. 2. Book-keeping—Describe books to be kept; give examples—taking of stock. *Text-book*—Stephen's "Practical System of Farm Book-keeping," Wm. Blackwood & Sons, Edinburgh; price 2s. 6d.

EXAMINATION FOR BURSARIES.

Candidates are examined in the Elements of Botany, Chemistry, Physical Geography, and Geology. *Text-books*—Balfour's "Elements of Botany;" Roscoe's "Lessons in Elementary Chemistry;" Page's "Introductory Text-Book of Geology;" and Geikie's "Primer of Physical Geography;" Lyell's "Students' Elements of Geology."

It has been resolved that, under ordinary circumstances, the Examinations shall be held annually in the end of October, and Candidates must enter their names with the Secretary before the 10th of that month, and produce the necessary certificates from the teachers of the schools they have attended.

The bursaries are open to candidates not less than fourteen years of age.

VETERINARY DEPARTMENT.

[*Note.*—An arrangement, as given at p. 15, having been made with the Royal College of Veterinary Surgeons that the holder of the Society's Veterinary Certificates are to be admitted Members of the Royal College, the Society is to cease holding examinations. But, not to disappoint those students who may have entered the teaching schools with the view of taking the Society's Certificate, the examinations will be continued till April 1881, in accordance with the former rules, it being clearly understood that unless fifteen students enter their names no examination will be held.]

In the year 1823 the Highland and Agricultural Society instituted lectures in Veterinary Science and Medicine, and arranged with the late Professor Dick to conduct the course.

In 1824 Examinations were commenced and Certificates granted, but only to Students who attended these lectures. Up to the present time 1150 certificates have been issued.

The Examinations are open to the Students of any Veterinary College established under Her Majesty's sign-manual.

In 1877 it was resolved that Students entering a Veterinary College after 1st January 1877, be subject to the following regulations :—

1. That there be two Examinations yearly, viz.—the First or Preliminary, and the Second or Final, both in April.

2. Students before entering their names for the First or Preliminary Examination, which embraces Botany, Chemistry, and Anatomy, must have attended two Winter Sessions and one Summer Session at a Veterinary College established under Her Majesty's sign-manual, and they must produce certificates from the Professor of each subject.

3. Students who have passed the First Examination, before entering their names for the Final Examination, which embraces Practice and Clinique, Physiology including Histology, Materia Medica, Cattle Pathology and Horse Pathology, must have attended three Winter Sessions and two Summer Sessions at a Veterinary College established under Her Majesty's sign-manual, and they must produce certificates from the Professor of each subject.

4. Students must pass the Practical and Clinical Examination before they can be examined on the other subjects enumerated in No. 3.

5. Students failing to pass either of the Examinations are required to attend a Veterinary College during one Summer and one Winter Session before being allowed to present themselves for Re-examination.

6. Members of the Medical Profession, or of any Colonial or Foreign Veterinary School or College, and others whose cases have been all specially considered and allowed by the Directors, may present themselves for Examination after attending one Winter Session at a Veterinary College in this country, and will receive the Certificate on passing one general Examination embracing all the subjects of the two Examinations.

In 1874 the Society resolved to vote annually Eight Silver Medals to each of the two Veterinary Colleges in Edinburgh, and to the one in Glasgow, for Class Competition ; and two Medium Gold Medals, open to all the Students who come up to the Final Examination for the Society's veterinary certificate for best general and best practical Clinical Examinations.

The examinations are conducted by leading members of the Medical Faculty and of the Veterinary Profession ; and a Certificate in the following terms, bearing the corporate seal and arms of the Society, and signed by the Examiners, is granted to those Students who pass the Final Examinations :—

HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

Veterinary Examination.

At Edinburgh, the day of 18

These are to certify that has attended as a student during the period prescribed by the regulations established by the Directors of the Society, and, having been examined by us, we consider him duly qualified to practise the Veterinary Art.

Graduates holding the Certificate of the Society are eligible for appointment as Veterinary Surgeons in Her Majesty's service.

ARTICLES OF AGREEMENT made and entered into this 15th day of January 1879, between the Highland and Agricultural Society of Scotland, incorporated by Royal Charter or Letters Patent, bearing date the 17th day of May 1787, by the name and title of the Highland Society of Scotland, at Edinburgh; and of new incorporated by the name and style of the Highland and Agricultural Society of Scotland, by Charter or Letters Patent, granted the 18th day of June 1834 (and hereinafter called "The Society"), of the one part; and the Royal College of Veterinary Surgeons, incorporated by Royal Charter or Letters Patent, dated the 8th day of March 1844 (and hereinafter called "The College"), of the other part:

Whereas the Society have from 1823 instituted lectures on veterinary science and medicine, and appointed examiners to examine students therein, and until 1844 granted to such students certificates of proficiency: And whereas, in 1848, the Society reconstituted its Board of Examiners, and have since granted annually certificates of qualification: And whereas it was, amongst other things, provided by the said letters patent of the 8th day of March 1844, that the concerns of the College should be directed and managed by a Council, to be constituted as therein mentioned: And further, that the said Council should and might make any orders, rules, and bye-laws for fixing and determining, amongst other things, the times, places, and manner of examining students who should have been educated at the Royal Veterinary College of London or the Veterinary College of Edinburgh, or such other Veterinary Colleges as therein mentioned, and who might be desirous to become members of the College, and for regulating the nature and extent of such examinations, and for the appointment of persons to examine and determine upon the fitness and qualifications of such students, and for the admission or rejection of such students, as members of the College, and for fixing and determining the sum and sums of money to be paid by such students, either previous to their examination or upon their admission as members of the College or otherwise, and generally touching all other matters relating to or connected with the College, and the same orders, rules, and bye-laws from time to time to alter, suspend, or repeal, and to make new orders, rules, and bye-laws in their stead as the Council should think most proper or expedient, so as the same were not repugnant to the letters patent now in recital, or to the laws of the realm: And whereas, by a supplemental charter or royal letters patent, dated the 23d day of August 1876, it was, amongst other things, declared that, with certain exceptions therein mentioned and not material for the purposes of these presents, the College and the Council of the same should have and continue to have all such and the same jurisdiction, powers, and authorities for and with respect to the government of the College, and for, *inter alia*, the making, ordaining, confirming, annulling, or revoking orders, rules, and bye-laws, and transacting and ordaining all other matters and things whatsoever for the regulation, government, and advantage of the College, as the College and the Council thereof respectively had under or by virtue of the said hereinbefore-recited charter or letters patent, or in any other lawful manner: And whereas, in pursuance of the powers conferred upon the College or the Council thereof by the said letters patent respectively, certain bye-laws have been made with respect, among other things, to the examination of candidates for the diploma of the College, and such bye-laws are still in force: And whereas the following arrangement has been made and entered into between the College and the Society with a view to the admission of the holders of the certificates of the Society as members of the College, and also for the purpose of terminating the examinations heretofore held by the Society: Now these presents witness, and it is hereby agreed and declared, and in particular the College (so far as the stipulation and provisions hereinafter contained are to be performed or observed by them) do hereby, for themselves and their successors, covenant and agree with and to the Society

and their successors ; and the Society (so far as the stipulation and provisions hereinafter contained are to be performed and observed by them) do hereby covenant and agree with and to the College and their successors in the manner following, that is to say—

1. Every or any holder of a certificate granted by the Society, in manner aforesaid since 1848, shall, on application and on payment of such fees as are hereinafter specified, be admitted as a member of the College, and shall not be required to submit to any further examination previous to such admission.

2. Every holder of a certificate granted by the Society as aforesaid from 1848 to 1872, shall be admitted as a member of the College on payment of a registration fee of one guinea.

3. All candidates for such admission to whom such certificates as aforesaid shall have been granted since the year 1872, shall in like manner, without being required to submit to any further examination previous thereto, be entitled to such admission on payment of fees according to the following scale or table (that is to say)—

(A) Every holder of a certificate granted during the year 1873, on payment of two guineas.
(B) Every holder of a certificate granted during the year 1874, on payment of three guineas.
(C) Every holder of a certificate granted during the year 1875, on payment of four guineas.
(D) Every holder of a certificate granted during the year 1876, on payment of five guineas.
(E) Every holder of a certificate granted during the year 1877, on payment of six guineas.
(F) Every holder of a certificate granted during the year 1878, on payment of seven guineas.

4. All students now enrolled at any of the teaching schools connected with the Society to whom such certificates as aforesaid shall hereafter be granted consistently with the provisions of these presents, shall be admitted and enrolled as members of the College on payment of a fee of seven guineas.

5. The examinations heretofore held by or on behalf of the Society shall be discontinued as from the 1st day of January 1879, but this stipulation shall not preclude or prevent the Society from holding examinations according to its existing bye-laws or regulations for persons already admitted as students of the Society who may hereafter elect or claim to be examined by the examiners thereof in preference to submitting to examinations by or on behalf of the College.

6. The College and Society respectively shall alter, vary, and annul their existing orders, rules, and bye-laws if and so far as may be necessary to give full and complete effect to this agreement, and shall also, if required, apply for and use their best endeavours to obtain supplemental charters for the same or the like object.

7. If any doubt, difference, or dispute shall hereafter arise between the parties hereto or their successors touching these presents, or the construction hereof, or any clause or provision herein contained, or the rights, duties, or liabilities of either party in connection therewith, the matter in difference shall be referred to two arbitrators or their umpire, pursuant to and so as with regard to the mode and consequences of the reference ; and in all other respects to conform to the provisions in that behalf contained in the Common Law Procedure Act, 1854, or any then subsisting statutory modification thereof : In witness whereof, the Society and the College respectively have

hereunto caused their respective seals to be affixed the day and year first above written.

(Signed) A. Gillon, *Director.*
„ Anthony Murray, *Director.*
„ Thomas Mylne, *Director.*
„ F. N. Menzies, *Secretary.*

The Seal of the Highland and Agricultural Society of Scotland.

(Signed) Wm. Henry Coates, *Secretary.*

The Seal of the Royal College of Veterinary Surgeons.

Board of Examiners.

1. *Botany.*—Professor Balfour; Dr Cleghorn of Stravithie, St Andrews.
2. *Chemistry.*—Dr W. Craig; A. Inglis M'Callum.
3. *Anatomy.*—Dr Dycer; C. Cunningham, Slateford; A. Spreull, Dundee.
4. *Practical and Clinical Examinations.*—Thomas A. Dollar, London; Finlay Dun, 2 Portland Place, London, W.; Tom Taylor, Manchester; John Lawson, Manchester; John Borthwick, Kirkliston; C. Cunningham, Slateford; Andrew Spreull, Dundee; Alexander Pottie, Paisley; W. D. Connochie, Selkirk.
5. *Physiology and Histology.*—Dr Dycer; C. Cunningham, Slateford; Andrew Spreull, Dundee.
6. *Materia Medica.*—Professor Balfour; Professor Douglas Maclagan; Finlay Dun; Dr Craig; A. I. M'Callum.
7. *Diseases of Horses.*—John Borthwick, Kirkliston; John Lawson, Manchester; Tom Taylor, Manchester.
8. *Diseases of Cattle, Sheep, Swine, and Dogs.*—Thomas A. Dollar, London; Alex. Pottie, Paisley; W. D. Connochie, Selkirk.

President of the Board—Dr Dycer, Edinburgh.
President of the Clinical Board—Thomas A. Dollar, London.

SYLLABUS OF VETERINARY EXAMINATIONS.

First or Preliminary Examination.

BOTANY.

Structure and functions of nutritive and reproductive organs of plants Natural families of medicinal and poisonous plants. Forage Plants. Diseases of agricultural plants caused by fungi. *Text-book*—Balfour's "Elements of Botany," A. & C. Black; 3s. 6d.

CHEMISTRY.

Elements of inorganic and organic chemistry; physiological chemistry; testing for commoner metals. *Text-book*—Roscoe's "Lessons in Elementary Chemistry," Macmillan & Co.; 4s. 6d.

ANATOMY.

Anatomy of bones, muscles, blood-vessels, nerves, and viscera of horse, cow, and dog. Description of relative position of parts displayed by various dissections. Demonstration from actual specimens of muscles, tendons, blood-vessels, and nerves, of horse's limbs, larynx, eye, &c. Comparative anatomy of veterinary patients. The breeding, rearing, feeding, and humane treatment of the live stock of the farm—the different breeds—their characteristics—the districts where they are principally met with—and also the best and most humane system of horse-breaking. *Text-books*—Strangeways' "Anatomy," Maclachlan & Stewart; 17s. Chauveau's "Comparative Anatomy of the Domesticated Animals," by George Fleming, Veterinary Surgeon, Royal Engineers, Churchill & Sons; £1, 11s. 6d.

Final Examination.

THE PRACTICAL AND CLINICAL EXAMINATION

Include diagnosis and treatment, orally and in writing, of cases of lameness and diseases of horses, cattle, sheep, dogs, and swine. Examination of horses as to soundness. Surgical and other operations performed on veterinary patients. Examination, chiefly of morbid specimens, mostly conducted at the abattoirs.

PHYSIOLOGY AND HISTOLOGY.

Minute anatomy of bone, blood, lung, and other tissues, of inflammatory products, and of tumours. Processes of digestion, circulation, respiration secretion, and excretion. Functions of nervous and reproductive systems *Text-books*—"Lessons in Elementary Physiology," by Thomas H. Huxley LL.D. and F.R.S., Macmillan & Co.; 4s. 6d. Kirke's "Physiology.' Bennet's "Physiology."

MATERIA MEDICA.

Sources, mineral, botanical, or animal. Physical and chemical properties. Preparations, physiological action, therapeutic uses and doses of medicines. Poisoning in the lower animals, symptoms, post-mortem appearances, antidotes. Writing of prescriptions. *Text-books*—"Veterinary Medicines, their Actions and Uses," by Finlay Dun, Edmonston & Douglas, Edinburgh; 12s. 6d. "Veterinarian's Pocket Conspectus," by Thomas Walley, M.R.C.V.S., Lorimer and Gillies, Edinburgh.

DISEASES OF HORSES.

Nature, symptoms, post-mortem appearances, causes, treatment, and prevention; accidents; construction and management of stables: shoeing *Text-books*—"Manual of Veterinary Science," by the late William Dick, A. & C. Black. Green's "Morbid Anatomy." Williams' "Principles and Practice of Veterinary Surgery," Maclachlan & Stewart, Edinburgh; 30s.

DISEASES OF CATTLE, SHEEP, SWINE, AND DOGS.

Nature, symptoms, post-mortem appearances: remedial and preventive treatment; dieting and general management of domestic animals. *Text-books*—Youatt on "Cattle, Sheep, Pigs, and Dogs." Blaine's "Principles of Veterinary Art." Gamgee's "Domesticated Animals in Health and Disease." Fullarton & Co., Edinburgh. Williams' "Principles and Practice of Veterinary Medicine;" 30s.

FORESTRY DEPARTMENT.

The Society grants First and Second Class Certificates in Forestry.

Board of Examiners.

1. *Science of Forestry and Practical Management of Woods.*—Dr Cleghorn, of Stravithie, St Andrews; John Macdougall, Ladywood, Dunkeld; William M'Corquodale, Scone Palace, Perth; J. Gray Thomson, Grantown, Strathspey.
2. *Elements of Botany.*—Professor Balfour.
3. *Nature and Properties of Soils, Drainage, and Effects of Climate.*—Professor Wilson.
4. *Land and Timber Measuring and Surveying; Mechanics and Construction, as applied to Fencing, Drainage, Bridging, and Road-Making, Implements of Forestry.*—A. W. Belfrage, C.E.
5. *Book-keeping and Accounts.*—Kenneth Mackenzie, C.A., and John Turnbull Smith, C.A.

Candidates must possess—1*st*, A thorough acquaintance with the details of practical forestry. 2*d*, a general knowledge of the following branches of study, so far as these apply to Forestry:—The Outlines of Botany; the Nature and Properties of Soils, Drainage and Effects of Climate; Land and Timber Measuring and Surveying; Mechanics and Construction, as applied to fencing, draining, bridging, and road-making; Implements of Forestry; Book-keeping and Accounts. The Examinations are open to Candidates of any age

SYLLABUS OF EXAMINATION.

I.—SCIENCE OF FORESTRY AND PRACTICAL MANAGEMENT OF WOODS.

1. Formation and ripening of Wood. Predisposing causes of decay. 2. Restoration of Wood-lands:—(1.) Natural reproduction; (2.) Artificial planting. 3. General management of plantations. Cropping by rotation. Trees recommended for different situations. 4. Season and methods of pruning, thinning and felling. 5. Circumstances unfavourable to the growth of trees. 6. Mechanical appliances for conveying and converting timber. Construction of saw-mills. 7. Qualities and uses of chief indigenous timbers. Processes of preserving timber. 8. Management of nurseries. Seed-sowing. 9. Collection of forest produce. 10. Manufacture of tar and charcoal. 11. Insects injurious to trees—protection of birds which prey upon them, drawing a distinction between birds which are beneficial and those which are destructive to trees.

II.—ELEMENTS OF BOTANY.

1. Nutritive Organs of plants.—Root, stem, leaves. Functions of root. Various kinds of stems, with examples. Use of the stem. Structure of leaves. Different kinds of leaves. Arrangement and functions of leaves. 2. Reproductive Organs.—Flower and its parts. Arrangement of the parts of the flower—calyx, corolla, stamens, pistil. Ovule. Mature pistil or fruit. Pruning and grafting. Seed. Young plant or embryo. Sprouting of the seed or germination. 3. General Principles of Classification.—Meaning of the terms Class, Order, Genus, Species. Illustrations taken from common forest trees and shrubs. Practical Examination on fresh specimens and models:

some of the latter may be seen in the Museum at the Royal Botanic Garden, which is open daily to the public free. Candidates may consult Professor Balfour's "Elements of Botany," published by A. & C. Black, Edinburgh, 1869. Price 3s. 6d.

III.—NATURE AND PROPERTIES OF SOILS, DRAINAGE AND EFFECTS OF CLIMATE.

1. The different descriptions of soils, their classification, and suitability to growth of different descriptions of timber trees. 2. The composition and constituents of soils. The relations between the soil and trees growing on it. 3. The effects of drainage on soils and on climate. 4. The mode of drainage for plantations. 5. The influence of temperature, rainfall, aspect, shelter, and prevailing winds on tree life. 6. The methods of registering and recording observations, and the instruments used.

IV.—LAND AND TIMBER MEASURING AND SURVEYING; MECHANICS AND CONSTRUCTION AS APPLIED TO FENCING, BRIDGING, AND ROAD-MAKING; IMPLEMENTS OF FORESTRY.

1. The use of the Level and Measuring Chain. Measuring and mapping surface areas. 2. The measurement of solid bodies—as timber, stacked bark, faggots, &c., earthwork. 3. The different modes of fencing and enclosing plantations; their relative advantages, durability, cost of construction, and repairs. 4. The setting out and formation of roads for temporary or permanent use. 5. The construction of bridges over streams and gullies; of gates or other entrances. 6. The different implements and tools used in planting, pruning, felling, barking, and working up timber trees, or preparing them for sale. Ewart's "Agricultural Assistant," Blackie & Son, Glasgow and Edinburgh, price 3s. 6d. Strachan's "Agricultural Tables," Oliver & Boyd, Edinburgh, price 2s. 6d.

V.—BOOK-KEEPING AND ACCOUNTS.

1. Questions in practice and proportion. 2. Book-keeping—describe books to be kept; give examples. Taking of stock.

CHEMICAL DEPARTMENT.

The object of the Chemical Department is to arrange Experiments to be conducted at the Society's Agricultural Stations, and to take notice of any matter of chemical interest connected with agriculture which may arise.

Chemist.—Dr ANDREW P. AITKEN, Highland and Agricultural Society's Chambers, No. 3 George IV. Bridge, and the Laboratory, Clyde Street, Edinburgh, where samples for analysis should be sent.

PREMIUMS.

GENERAL REGULATIONS FOR COMPETITORS.

All reports must be legibly written, and on one side of the paper only; they must specify the number and subject of the Premium for which they are in competition; they must bear a distinguishing motto, and be accompanied by a sealed letter similarly marked, containing the name and address of the Reporter—initials must not be used.

No sealed letter, unless belonging to a Report found entitled to at least one-half of the premium offered, will be opened without the author's consent.

Reports for which a Premium, or one-half of it, has been awarded, become the property of the Society, and cannot be published in whole or in part, nor circulated in any manner, without the consent of the Directors. All other papers will be returned to the authors, if applied for within twelve months.

When a Report is unsatisfactory, the Society is not bound to award the whole or any part of a premium.

All Reports must be of a practical character, containing the results of the writer's own observation or experiment, and the special conditions attached to each Premium must be strictly fulfilled. General essays, and papers compiled from books, will not be rewarded. Weights and measurements must be indicated by the Imperial standards.

The Directors, before awarding a Premium, shall have power to require the writer of any report to verify the statements made in it.

The decisions of the Board of Directors are final and conclusive as to all Premiums, whether for Reports or at General or District Shows; and it shall not be competent to raise any question or appeal touching such decisions before any other tribunal.

The Directors will welcome papers from any Contributor on any suitable subject not included in the Premium List; and if the topic and the treatment of it are both approved, the Writer will be remunerated, and his paper published.

CLASS I.

REPORTS.

SECTION 1.—THE SCIENCE AND PRACTICE OF AGRICULTURE.

FOR APPROVED REPORTS.

1. On the Agriculture of the Counties of Forfar and Kincardine—Thirty Sovereigns. To be lodged by 1st November 1880.

The Report should embrace full details of the different systems of Farm Management observed in the Counties, and of the progress which Agriculture and other industries have made within the last 25 years.

2. On the Agriculture of the Counties of Clackmannan and Kinross—Twenty Sovereigns. To be lodged by 1st November 1880.

The Report should embrace full details of the different systems of Farm Management observed in the Counties, and of the progress which Agriculture and other industries have made within the last 25 years.

3. On the Agriculture of Bute and Arran—Twenty Sovereigns. To be lodged by 1st November 1880.

The Report should embrace full details of the different systems of Farm Management observed in the County, and of the progress which Agriculture and other industries have made within the last 25 years.

4. On the Agriculture of the County of Lanark—Forty Sovereigns. To be lodged by 1st November 1880.

The Report should embrace full details of the different systems of Farm Management observed in the County, and of the progress which Agriculture and other industries have made within the last 25 years.

5. On the Agriculture of the County of Stirling—Twenty Sovereigns. To be lodged by 1st November 1881.

The Report should embrace full details of the different systems of Farm Management observed in the County, and of the progress which Agriculture and other industries have made within the last 25 years.

6. On the best method of ascertaining, at the termination of a lease, the unexhausted value of tile drainage or other work of that kind, performed by a tenant during the currency of a lease —Fifteen Sovereigns. To be lodged by 1st November 1880.

7. On the best method of ascertaining, at the termination of a lease, the unexhausted value of lime applied by a tenant during the currency of a lease, specifying the difference (if any) between different kinds of lime and also gas or refuse lime—Fifteen Sovereigns. To be lodged by 1st November 1880.

8. On the best method of ascertaining, at the termination of a lease, the unexhausted manurial value of manures and feeding stuffs applied to and consumed upon a farm by a tenant, giving details, based on experience, of such manurial value, and the effect of different crops or rotations of crops in exhausting it—Fifteen Sovereigns. To be lodged by 1st November 1880.

9. On the Physiological Distinctions in the condition of the Scottish Peasantry in different Districts—Thirty Sovereigns. To be lodged by 1st November 1880.

The Reporter must furnish statistics of the longevity, &c., of the peasantry, as contrasted with other classes, and give suggestions for the amelioration of any causes which affect them injuriously.

10. On the results of experiments for fixing and retaining the volatile and soluble ingredients in farm-yard manure—Twenty Sovereigns. To be lodged by 1st November 1880.

The Report must detail the treatment adopted to fix and retain these ingredients—the materials used for that purpose—and the quantity and cost thereof—comparative analyses of the manure with and without the treatment, and also a statement of the crops grown with manure with and without such treatment, must be given by the Reporter. The experiments to have extended over at least two years and crops.

11. On the results of experiments for ascertaining the comparative value of farm-yard manure obtained from cattle fed upon different varieties of food, by the application of such manures to farm crops—Twenty Sovereigns. To be lodged by 1st November in any year.

The Report must state the effects produced on two successive crops by the application of manure obtained from cattle fed on different sorts of food, such as turnips and straw alone; and turnips and straw, with an addition of oil-cake, linseed, bean-meal, grain, or other substances. The animals should be as nearly as possible of the same age, weight,

condition, and maturity, and each lot should receive daily the same quantity of litter; and, except as to the difference of food, they must be treated alike.

The preparation of the manure, by fermentation or otherwise, should be in every respect the same; and it is desirable that not less than two several experiments be made with each kind, and that the ground to which it is to be applied be as equal as possible in quality and condition.

12. On the comparative value of manure made in the ordinary manner, and of the manure kept under cover till applied to the land—Twenty Sovereigns. To be lodged by 1st November in any year.

The experiment may be conducted either with manure made in the open straw-yard, contrasted with that made in covered hammels or boxes, or with manure made in feeding houses, part of which shall have been placed under cover, and part removed to the open dung-pit, and kept carefully unmixed with any other manure. Preference will be given to experiments embracing both of these modes. The cattle must be fed and littered alike. There must be at least an acre of land experimented on with each sort of manure; the different lots must be manured to the same extent, and be equal in soil, and the crops must be accurately weighed and measured on two separate portions of each lot, not less than 20 poles. The result, as given by two successive crops, to be reported.

13. On the means successfully employed for obtaining new Agricultural Plants, or new and superior varieties, or improved sub-varieties, of any of the cereal grains, grasses, roots, or other agricultural plants at present cultivated in this country—Medals, or sums of Money not exceeding Fifty Sovereigns. To be lodged by 1st November in any year.

It is necessary that the varieties and sub-varieties reported upon shall have been proved capable of reproduction from seed, and also that the relation they bear to others, or well-known sorts, should be stated. The Reporter is further requested to mention the effects that he may have observed produced by different soils, manures, &c., on the plants forming the subject of report, and how far he may have ascertained such effects to be lasting.

Should any improved variety reported upon be the result of direct experiment by cross impregnation, involving expense and long-continued attention, a higher premium will be awarded.

14. On the cultivation of the Cabbage as a field crop—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November 1880.

The experiment must be conducted in Scotland on not less than one acre, and contrasted with a like extent under turnips in the same field. Both lots must have been under one rotation, and must be prepared and manured in the same manner.

15. On the Insects which prey upon Agricultural Plants, and the diseases occasioned by them, and the best means of prevention—Twenty Sovereigns. To be lodged by 1st November 1880.

The Report to be accompanied, where practicable, by specimens of the insects.

16. On the hardy and useful Herbaceous Plants of any country where such climate exists as to induce the belief that the plants may be beneficially introduced into the cultivation of Scotland —The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

Attention is particularly directed to the Grains and Grasses of China, Japan, the Islands of the Eastern Archipelago, the Himalaya country, the Falkland and South Sea Islands, California, and the high north-western district of America.

Reporters are required to give the generic and specific names of the plants treated of, with the authority for the same—together with the native names, so far as known; and to state the elevation of the locality and nature of the soil in which they are cultivated, or which they naturally inhabit, with their qualities or uses; and it is further requested that the descriptions be accompanied, in so far as possible, with specimens of the plants, and their fruit, seed, and other products.

17. On the adulteration of Agricultural Seeds, whether by colouring, mixing, or otherwise, and the best means of detecting the same, and preventing their sale—Ten Sovereigns. To be lodged by 1st November 1880.

18. On the comparative advantages of grazing Cattle and Sheep, together or separately, upon permanent pastures—Ten Sovereigns. To be lodged by 1st November 1880.

The Reporter's attention is specially directed to unenclosed lands on hill, moorland, marshy, or heathery districts occupied by natural grasses.

19. On the comparative advantages of fattening Cattle in stalls, in loose houses or boxes, and in sheds or hammels—Twenty Sovereigns. To be lodged by 1st November in any year.

The Report must detail the comparative result of actual experiments. The same quantities and kinds of food must be used. Information is required as to the comparative expense of attendance, the cost of erecting the buildings, and any other circumstance deserving of attention. The state of the weather during the experiment, in point of temperature and wetness, and the advantages or disadvantages of clipping cattle put up to feed, must be particularly noted and reported.

20. On experiments for ascertaining the actual addition of weight to growing or fattening Stock, by the use of different kinds of food—Twenty Sovereigns. To be lodged by 1st November in any year.

The attention of the Experimenter is directed to turnips, carrots, beet, mangold-wurzel, potatoes, cabbage, as well as to beans, oats, barley, Indian corn, linseed, oil-cake or rape-cake, and to the effect of warmth and proper ventilation, and the difference between food cooked and raw. The above roots and other kinds of food are merely suggested; competitors are neither restricted to them nor obliged to experiment on all of them.

When experiments are made with linseed and cake, attention should be paid to the comparative advantages, economically and otherwise, of the substance in these two states.

Before commencing the comparative experiments, the animals must be fed alike for some time previously.

The progress of different breeds may be compared. This will form an interesting experiment of itself, for Reports of which encouragement will be given.

N.B.—The experiments specified in the two previous subjects must be conducted over a period of not less than three months. No lot shall consist of fewer than four Cattle or ten Sheep. The animals selected should be of the same age, sex, and breed, and, as nearly as possible, of the same weight, condition, and maturity. The live weight before and after the experiment must be stated, and, if killed, their dead weight and quantity of tallow.

21. On the results of different modes of feeding on the quantity and quality of Butter and Cheese produced—Ten Sovereigns. To be lodged by 1st November 1880.

22. On the Border Leicester Breed of Sheep, and the means that have been or might be used for its improvement—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November 1880.

23. On the breeding of Horses for the farm, road, or field, their treatment when young, and the adaptability of the various soils to the breeding and rearing of Horses—Twenty Sovereigns. To be lodged by 1st November 1880.

This Report is confined to breeders of horses, who are requested to state their own experiments and results.

The Report must state the diseases arising from pasturing on the various soils, and how to prevent them.

24. On the value of Inoculation as a prevention of *Pleuro-Pneumonia Contagiosa*; the best method of performing the operation; the favourable and unfavourable results, and statistics—Ten Sovereigns. To be lodged by 1st November 1880.

25. On the history (ancient and modern), nature, symptoms, and treatment of Sheep-pox (*Variola Ovina*), with a minute description of the symptoms which distinguish it from all other eruptive ovine diseases—Ten Sovereigns. To be lodged by 1st November 1880.

26. On the nature, symptoms, causes, preventive and remedial treatment, and *post-mortem* appearances of Louping-ill in Sheep. The popular as well as the scientific names to be made use of—Ten Sovereigns. To be lodged by 1st November 1880.

27. On the effect of Sewage upon the Animal System, introduced either with drinking water or with herbage when it has been used as a top-dressing—Ten Sovereigns. To be lodged by 1st November 1880.

28. On a description of any scheme whereby Town Sewage has been successfully utilised for irrigation in Agriculture—Twenty Sovereigns. To be lodged by 1st November in any year.

The scheme described must have been in operation for at least two years—the description to include (1) the manner in which the land was drained and prepared for irrigation, and the cost of preparing it per acre; (2) the quantity of sewage used per acre, and the mode in which it is applied to the fields; (3) the annual cost per acre of wages, &c., in working the process; (4) the kind, amount, and value of the crops obtained per acre.

29. On any useful practice in Rural Economy adopted in other countries, and susceptible of being introduced with advantage into Scotland—The Gold Medal. To be lodged by 1st November in any year.

The purpose chiefly contemplated by the offer of this premium is to induce travellers to notice and record such particular practices as may seem calculated to benefit Scotland. The Report to be founded on personal observation.

Section 2.—ESTATE IMPROVEMENTS.

FOR APPROVED REPORTS.

1. By the Proprietor in Scotland who shall have executed the most judicious, successful, and extensive improvement—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

Should the successful Report be written for the Proprietor by his resident factor or farm manager, a Medium Gold Medal will be awarded to the writer in addition to the Gold Medal to the Proprietor.

The merits of the Report will not be determined so much by the mere extent of the improvements, as by their character and relation to the size of the property. The improvements may comprise reclaiming, draining, enclosing, planting, road-making, building, and all other operations proper to landed estates. The period within which the operations may have been conducted is not limited, except that it must not exceed the term of the Reporter's proprietorship.

2. By the Proprietor in Scotland who shall have erected on his estate the most approved Farm-buildings—The Gold Medal. Reports, Plans, and Specifications to be lodged by 1st November in any year.

3. By the Proprietor or Tenant in Scotland who shall have reclaimed within the ten preceding years not less than forty acres of waste land—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

4. By the Tenant in Scotland who shall have reclaimed within the ten preceding years not less than twenty acres of waste land—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

5. By the Tenant in Scotland who shall have reclaimed not less than ten acres within a similar period—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November in any year.

The Reports in competition for Nos. 3, 4, and 5 may comprehend such general observations on the improvement of waste lands as the writer's experience may lead him to make, but must refer especially to the lands reclaimed—to the nature of the soil—the previous state and probable value of the subject—the obstacles opposed to its improvement—the details of the various operations—the mode of cultivation adopted—and the produce and value of the crops produced. As the required extent cannot be made up of different patches of land, the improvement must have relation to one subject; it must be of a profitable character, and a rotation of crops must have been concluded before the date of the Report. *A detailed statement of the expenditure and return* and a certified measurement of the ground are requisite.

6. By the Proprietor or Tenant in Scotland who shall have improved within the ten preceding years the pasturage of not less than thirty acres, by means of top-dressing, draining, or otherwise, without tillage, in situations where tillage may be inexpedient—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

7. By the Tenant in Scotland who shall have improved not less than ten acres within a similar period—The Minor Gold Medal. To be lodged by 1st November in any year.

Reports in competition for Nos. 6 and 7 must state the particular mode of management adopted, the substances applied, the elevation and nature of the soil, its previous natural products, and the changes produced.

Section 3.—MACHINERY.

For the best and most approved Steam Reaping Machine, to cut and bind to the satisfaction of a Committee of the Society. The machine to be tested during one whole season in such manner as the Committee may direct—Fifty Sovereigns. Intimation of intention to compete must be lodged by the 1st of June 1880.

The Harvester to work in the vicinity of Edinburgh during the whole harvest. The owner of the Harvester to arrange with the farmers on whose ground it is to be employed, but the farms must be approved by the Society. A Committee will be appointed to visit the farms and inspect the work as well as the working of the machine, and report to the Directors.

FOR APPROVED REPORTS.

1. On such inventions or improvements, by the reporters, of any implement or machine as shall be deemed by the Society of public utility—Medals, or sums of money not exceeding Fifty Sovereigns. To be lodged at any time.

Reports should be accompanied by drawings and descriptions of the implement or machine, and, if necessary, by a model.

2. On the best and most improved Cattle Truck for feeding and watering the animals in transit—Twenty Sovereigns. To be lodged by 1st November 1880.

Reports must be accompanied with drawings and description, or, if necessary, by a model.

Section 4.—FORESTRY DEPARTMENT.

FOR APPROVED REPORTS.

1. By the Proprietor in Scotland who shall, within the five preceding years, have planted not less than 150 acres—The Gold Medal. To be lodged by 1st November in any year.

The whole planting operations which may have been conducted by the Reporter within the five years, whether completed or not, must be embraced, and he must state the expense—description of soils—age, kind, and number of trees planted per acre—mode of planting, draining, and fencing—general state of the plantation—and any other observations of interest.

2. On Plantations of not less than eight years' standing, formed on deep peat bog—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November 1880.

The premium is strictly applicable to deep peat or flow moss; the condition of the moss previous to planting, as well as at the date of the Report, should, if possible, be stated.

The Report must describe the mode and extent of the drainage, and the effect it has had in subsiding the moss—the trenching, levelling, or other preliminary operations that may have been performed on the surface—the mode of planting—kinds, sizes, and numbers of trees planted per acre—and their relative progress and value, as compared with plantations of a similar age and description grown on other soils in the vicinity.

3. On the more extended introduction of hardy, useful, or ornamental Trees, which have not hitherto been generally cultivated in Scotland—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November in any year.

The Report should specify as distinctly as possible the kind of trees introduced. The adaptation of the trees for use or ornament, and their comparative progress should be mentioned. Attention is directed to the introduction of any tree as a nurse in young plantations, which by growing rapidly for several years, and attaining maturity when at the height of 20 or 25 feet, might realise the advantage and avoid the evils of thick planting.

4. On the *Pinus Insignis* and its value for planting in Scotland, with detailed statistics of its progress in the country—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November 1880.

5. On the varieties of Trees best adapted for planting as shelter in the Islands of Scotland—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November 1880.

6. On the old and remarkable Beeches (*Fagus Sylvatica*) in Scotland—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November 1880.

Details of their growth, measurements, and condition, and any particulars of their history must be given. Photographs and drawings are desirable.

7. On the old and remarkable Oaks (*Quercus Pedunculata*) in Scotland—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November 1880.

Details of their growth, measurements, and condition, and any particulars of their history, must be given. Photographs and drawings are desirable.

8. On the deterioration in quality and durability of Home-Grown Timber at the present day, especially regarding Scotch Fir, as compared with the timber of the old Scotch forests, and suggestions for a remedy—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November 1880.

9. On the Cutting and Transport of Firewood (soft and hard wood), with detailed statement of charges—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November 1880.

In many districts large branches and tops of trees are burned up, which in England, and much more on the Continent, are sold at a profit. The Report should state the system pursued, and contain practical suggestions for utilising fragments now destroyed.

10. On the more extended cultivation in Scotland of Charcoal-producing Plants, for gunpowder or commercial purposes—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November 1880.

Reference to be made to suitable varieties of plants not generally grown in this country for that purpose, such as *Rhamnus Frangula*, prices realisable, and suggestions for their more general introduction, treatment, &c.

11. On the Woods, Forests, and Forestry in the county of Perth—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November 1880.

12. On the Woods, Forests, and Forestry in the county of Ross—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November 1880.

13. On the Woods, Forests, and Forestry in the county of Inverness—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November 1880.

14. On the comparative advantages of High Forest with Coppice, or Coppice with a limited number of Standard Trees—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November 1880.

15. On the utilisation of waste produce of Forests and Woodlands, as matter for making, either separately or in combination with other substances, an Artificial Fuel—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November 1880.

16. On the Insects most injurious to Forest Trees, and the diseases occasioned by them, and the best means of prevention —Twenty Sovereigns. To be lodged by 1st November 1880.

The Report to be accompanied, where practicable, by specimens of the insects.

17. On the effects of the severe Frost of December 1879 on Trees and Shrubs generally, in different soils and situations, and destruction to Woods and Trees by the gale of the 28th December 1879—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November 1880.

CLASS II.

DISTRICT COMPETITIONS.

The Money Premiums and Medals awarded at District Competitions will be issued in January next. No payments must, therefore, be made by the Secretary or Treasurer of any local Association.

Grants in aid of DISTRICT COMPETITIONS *for* 1881 *must be applied for before* 1st NOVEMBER *next.*

When a Grant has expired, the District cannot apply again for aid for two years.

SECTION 1.—CATTLE.

Note.—The Society's Cattle Premiums are granted to each District for three alternate years, on condition that the District shall, in the two intermediate years, continue the Competitions by offering for the same description of stock a sum not less than one-half of that given by the Society.

At the intermediate Competitions, a Silver Medal will be placed at the disposal of the Committee, to be awarded for the Best Bull which has gained a first prize at a previous District or General Show, and of the Class for which the District receives Premiums; also three Medium Silver Medals to be given along with the first prize in the three Classes of Cattle, provided there are not fewer than two lots exhibited in each Class.

The selection of the Breed is left to the local Committee. See Rule C.

DISTRICTS.

1. DISTRICT OF UPPER STRATHEARN.—*Convener,* D. R. Williamson of Lawers, Crieff; *Secretary,* James M'Laren, junior, Crieff. Granted 1876.
2. DISTRICT OF FORMARTINE.—*Convener,* The Earl of Aberdeen; *Secretary,* Alex. Davidson, Mains of Cairnbrogie, Old Meldrum. Granted 1878.
3. DISTRICT OF THE KINGLASSIE SOCIETY.—*Convener,* R. Sinclair Ayton of Inchdairnie, Kirkcaldy; *Secretary,* David Beath, Auchmuir, Leslie. Granted 1878.
4. COUNTY OF AYR.—*Convener,* Hon. G. R. Vernon, Auchans House, Kilmarnock; *Secretary,* James M'Murtrie, Ayr. Granted 1878.
5. CENTRAL BANFFSHIRE.—*Convener,* William Longmore, Keith; *Secretary,* J. Geddes Brown, Keith. Granted 1880.
6. STIRLINGSHIRE.—*Convener,* Sir James R. Gibson Maitland of Clifton Hall, Bart., Craigend, Stirling; *Secretary,* Robert Taylor, 22 Barnton Place, Stirling. Granted 1880.
7. ISLANDS OF MULL, COLL, AND TIREE.—*Convener,* James Noel Forsyth of Quinish, Tobermory; *Secretary,* David Thorburn, Calgary, Tobermory. Granted 1880.

8. RENFREWSHIRE.—*Convener*, P. Comyn Macgregor of Brediland, Lonend House, Paisley; *Secretary*, William Bartlemore, County Buildings, Paisley. Granted 1880.
9. DISTRICT OF TURRIFF.—*Convener*, Alexander Stuart of Laithers, Turriff; *Secretary*, William Ingram, Sunnyhill, Turriff. Granted 1877.
10. DISTRICT OF AVONDALE.—*Convener*, Thomas Tennent of Priestgill, Strathaven; *Secretary*, William Lambie of Halburn, Strathaven. Granted 1877.
11. DISTRICT OF WEEM.—*Convener*, Sir Robert Menzies of Menzies, Bart., Farlever, Aberfeldy; *Secretary*, R. A. Meikle, Camserney Cottage, Aberfeldy. Granted 1877.
12. DISTRICT OF THE DEESIDE UNION.—*Convener*, Colonel Innes of Learney, Torphins; *Secretary*, James Shaw, Tillyching, Lumphanan. Granted 1879.
13. DISTRICT OF LORN.—*Convener*, Colonel M'Dougall of Dunollie, Oban; *Secretary*, Donald Macgregor, Solicitor, Oban. Granted 1879.

PREMIUMS.

1. Best Bull, of any pure breed, having gained a previous first prize.
   The Silver Medal.
2. Best Bull, of any pure breed, calved before 1st January 1878.*
   Medium Silver Medal and £4
   Second best, ... £3
   Third best, ... £1
3. Best Bull, of any pure breed, calved after 1st January 1878.
   Medium Silver Medal and £3
   Second best, ... £2
   Third best, ... £1
4. Best 2-year old Heifer (if Highland breed, 3 years), of any pure breed.
   Medium Silver Medal and £3
   Second best, ... £2
   Third best, ... £1

In 1880.

No. 1 is in competion for the last year.
Nos. 2, 3, and 4 for the second year.
Nos. 5, 6, 7, and 8 for the first year.
Nos. 9, 10, 11, 12, and 13 compete for local Premiums.

SECTION 2.—HORSES.

FOR AGRICULTURAL PURPOSES.

Note.—The Society's Stallion Premiums are granted to each District for two years, and are followed by Premiums for other two years for Brood Mares, and again for a similar period by Premiums for Entire Colts and Fillies.

1. STALLIONS.

1. DISTRICT OF THE LESMAHAGOW SOCIETY.—*Convener*, Gavin Hamilton of Auldtown, Lesmahagow; *Secretary*, John Hamilton, British Linen Co. Bank, Lesmahagow. Granted 1879.
2. DISTRICT OF CARRICK.—*Convener*, John Rankine of Beoch, Lochlands, Maybole; *Secretary*, David Brown, Maybole. Granted 1879.
3. DISTRICT OF CUPAR AND ST ANDREWS.—*Convener*, David Bayne Meldrum of Kincaple, Cupar Fife: *Secretary*, William Dingwall, Ramornie, Ladybank. Granted 1880.

* In 1881, the dates of calving of cattle will be counted as from the 1st of December in place of 1st January.

4. Dumfries Horse Association.—*Convener*, John M'Tier of Ladyfield, Dumfries; *Secretary*, Mr Robinson (Adamson & Symons), Dumfries. Granted 1880.
5. Nairnshire.—*Convener*, Robert Anderson of Lochdhu, Nairn; *Secretary*, John Joss, Budgate, Cawdor. Granted 1880.
6. Earl of Selkirk's Tenantry and District.—*Convener*, Andrew Lusk, Howell, Kirkcudbright; *Secretaries*, D. G. Williamson, Bombie, Kirkcudbright; and James Muir, Lochfergus, Kirkcudbright. Granted 1880.
7. District of Central Strathearn.—*Convener*, John Kerr, Rossie Ochil, Bridge of Earn; *Secretary*, Robert Gardiner, Chapelbank, Auchterarder. Granted 1880.

Premium.

Best Stallion, not under 3 years, and not above 12 years old, . £25

In 1880.

Nos. 1 and 2 are in competition for the last year.
Nos. 3, 4, 5, 6 and 7 for the first year.

2. Brood Mares.

1. County of Clackmannan.—*Convener*, James Johnstone of Alva; *Secretary*, D. & T. Fisher, Jellyholm, Alloa. Granted 1879.
2. District of Lockerbie.—*Convener*, Sir Alexander Jardine of Applegarth, Bart., Jardine Hall, Lockerbie; *Secretary*, David Dobie, Banker, Lockerbie. Granted 1879.
3. Eastern District of Berwickshire.—*Convener*, John Allan, Redheugh, Cockburnspath; *Secretary*, James Gibson, Guns-green, Ayton. Granted 1880.
4. District of Lauderdale.—*Convener*, George M'Dougal, Blythe, Lauder; *Secretary*, Thomas Broomfield, Lauder. Granted 1880.
5. Machars District of Wigtownshire.—*Convener*, Sir Herbert E. Maxwell of Monreith, Bart., Port William; *Secretary*, Charles M. Routledge, Banker, Port William. Granted 1880.
6. County of Peebles.—*Convener*, Lord Arthur Cecil, Orchard Mains, Innerleithen; *Secretary*, William Riddell, Howford, Peebles. Granted 1880.
7. Eastern District of Stirlingshire.—*Convener*, Ralph Stark of Summerford, Falkirk; *Secretary*, Thomas Binnie, Falkirk. Granted 1880.

Premiums.

1. Best Brood Mare, ... Medium Silver Medal and £4
2. Second best, ... £3
3. Third best, ... £1

In 1880.

Nos. 1 and 2 are in competition for the last year.
Nos. 3, 4, 5, 6, and 7 for the first year.

3. Entire Colts and Fillies.

1. District of Easter Ross.—*Convener*, David Monro of Allan, Tain; *Secretary*, D. A. MacBean Ross, Banker, Tain. Granted 1879.
2. District of the Royal Northern Society.—*Convener*, Colonel Innes of Learney, Torphins; *Secretary*, Alexander Yeats, Royal Northern Society, Aberdeen. Granted 1879.
3. District of the Dalbeattie Society.—*Convener*, W. H. Maxwell of Munches, Dalbeattie; *Secretary*, R. W. Macnab, Union Bank, Dalbeattie. Granted 1880.

4. Rhins District of Wigtownshire.—*Convener*, R. Vans-Agnew of Barnbarroch, M.P.; *Secretary*, Hugh Adair, Stranraer. Granted 1880.
5. District of Auchtermuchty.—*Convener*, John Bogie, Balcanquhal, Auchtermuchty; *Secretary*, H. W. Walker, Auchtermuchty. Granted 1880.
6. District of the East of Fife Society.—*Convener*, John Anstruther Thomson of Charlton, Colinsburgh; *Secretary*, John Flockhart, Colinsburgh. Granted 1880.

Premiums.

1. Best Entire Colt, foaled after 1st January 1878, Medium Silver Medal and £3
   Second best, ... £2
   Third best, ... £1
2. Best Entire Colt, foaled after 1st January 1879, Medium Silver Medal and £2
   Second best, ... £1
   Third best, ... 10s.
3. Best Filly, foaled after 1st January 1878, Medium Silver Medal and £3
   Second best, ... £2
   Third best, ... £1
4. Best Filly, foaled after 1st January 1879, Medium Silver Medal and £2
   Second best, ... £1
   Third best, ... 10s.

In 1880.

Nos. 1 and 2 are in competition for the last year.
Nos. 3, 4, 5, and 6 for the first year.

Section 3.—SHEEP.

Note.—The Society's Sheep Premiums are granted to each District for three alternate years, on condition that the District shall, in the two intermediate years, continue the Competitions by offering for the same description of stock a sum not less than one-half of that given by the Society.

At the intermediate Competitions, a Silver Medal will be placed at the disposal of the Committee, to be awarded for the best Tup which has gained a first prize at a previous District or General Show, and of the class for which the District receives Premiums; also four Medium Silver Medals, to be given along with the first prize in the four Classes of Sheep, provided there are not less than two lots in each class.

The selection of the Breed is left to the local Committee. See Rule 6.

Districts.

1. Island of Arran.—*Convener*, James Paterson, Whitehouse, Lamlash; *Secretary*, William Tod, Glenree, Lamlash. Granted 1876.
2. District of the Border Union Society.—*Convener*, John Ord of Over Whitton, Nisbet, Kelso; *Secretary*, John Usher, 25 Bridge Street, Kelso. Granted 1878.
3. Islands of Islay, Jura, and Colonsay.—*Convener*, Kirkman Finlay of Dunlossit, Portaskaig, Islay; *Secretary*, Samuel M. M'Conechy, Daill, Bridgend, Islay. Granted 1878.
4. District of Dunoon.—*Convener*, A. S. Finlay of Castle Toward, Greenock; *Secretary*, Archibald Mitchell, junior, Clydesdale Bank, Dunoon. Granted 1880.

5. District of Dalkeith.—*Convener*, Sir James Gardiner Baird of Saughton Hall, Bart., Inch House, Liberton; *Secretary*, James Wilson, Wester Cowden, Dalkeith. Granted 1880.
6. Upper Ward of Lanarkshire.—*Convener*, John Ord Mackenzie of Dolphinton; *Secretary*, David Oswald, teacher, Abington. Granted 1880.
7. District of Lochaber.—*Convener*, D. P. M'Donald, Invernevis, Fort-William; *Secretary*, N. B. Mackenzie, British Linen Bank, Fort-William. Granted 1880.
8. District of Lower Annandale.—A. H. Johnstone Douglas of Lockerbie, Glen Stuart, Annan; *Secretary*, William Dobbie, Annan. Granted 1880.
9. District of the Northern Pastoral Club.—*Convener*, Sir Kenneth S. Mackenzie of Gairloch, Bart., Conan House, Dingwall; *Secretary*, Walter Mundell, Eilanreach, Lochalsh. Granted 1877.
10. District of Nithsdale.—*Convener*, John Gilchrist Clark of Speddoch, Dalton, Thornhill; *Secretary*, Wm. Austin, Bank Agent, Thornhill. Granted 1877.
11. District of Athole and Weem.—*Convener*, Archibald Butter of Faskally, Pitlochry; *Secretary*, James Mitchell, Pitlochry. Granted 1879.
12. District of the United East Lothian Society.—*Convener*, Sir Hew Dalrymple of North Berwick, Bart., Luchie, North Berwick; *Secretaries*, Richardson and Gemmell, Haddington. Granted 1879.
13. District of Nether Lorn.—*Convener*, James Bett, Breadalbane Estate Office, Kenmore, Aberfeldy; *Secretary*, Angus White, Easdale, Oban. Granted 1879.
14. District of Argyll.—*Convener*, Sir John W. P. Orde of Kilmory, Bart., Lochgilphead; *Secretary*, A. M'Nair, Ri-Cruin, Lochgilphead. Granted 1879.

Premiums.

1.	Best Tup having gained a previous First Prize,	The Silver Medal.
2.	Best Tup above One Shear, . .	Medium Silver Medal and £3
	Second best, ...	£1
	Third best, ...	10s.
3.	Best Shearling Tup, ...	Medium Silver Medal and £3
	Second best, ...	£1
	Third best, ...	10s.
4.	Best 3 Ewes above One Shear, . .	Medium Silver Medal and £3
	Second best	£1
	Third best, ...	10s.
5.	Best 3 Gimmers or Shearling Ewes, .	Medium Silver Medal and £3
	Second best, ...	£1
	Third best, ...	10s

In 1880.

No. 1 is in competition for the last year.
Nos. 2 and 3 for the second year.
Nos. 4, 5, 6, 7, and 8 for the first year.
Nos. 9, 10, 11, 12, 13, and 14 compete for local Premiums.

Section 4.—SWINE.

The Society's Swine Premiums are given for three consecutive years.

Premiums.

1. Best Boar having gained a previous First Prize, The Silver Medal.
2. Best Boar, ... Medium Silver Medal and £3
   Second best, ... £1
   Third best, ... 10s.
3. Best Brood Sow, ... Medium Silver Medal and £2
   Second best, ... £1
   Third best, ... 10s.

In 1880.

No application has been received.

Section 5.—DAIRY PRODUCE.

The Society's Dairy Premiums are given for three consecutive years.

Premiums.

1. Best Couple of Sweet Milk Cheeses belonging to a Proprietor, The Silver Medal.
2. Best Couple of Sweet Milk Cheeses, Medium Silver Medal and £2
   Second best, ... £1
   Third best, ... 10s.
3. Best Cured Butter (not less than 14 lbs.), belonging to a Proprietor, The Silver Medal.
4. Best Cured Butter (not less than 14 lbs.), Medium Silver Medal and £2
   Second best, ... £1
   Third best, ... 10s.

In 1880.

No application has been received.

Rules of Competition.

1. The Members of the Highland and Agricultural Society connected with the respective districts are appointed Committees for arranging the Competitions, the Convener being appointed by the Directors: five members to be a quorum.

2. The Convener of each District shall summon a meeting of Committee for the purpose of determining the time and place of Competition, the nomination of Judges, and other preliminary arrangements. The time and place (which must be within the bounds of the District, unless in reference to Stallions special permission has been obtained to the contrary) shall be publicly intimated by Conveners.

3. The Money Premiums awarded at District Competitions will be paid in January next, by precepts issued by the Directors. No payments must, therefore, be paid by the Secretary or Treasurer of any local Association.

4. Stock must be the property of the Exhibitor at the date of Entry. *No entry shall be received later than one week previous to the Show.* Entry-Money shall not exceed 2½ per cent. on the amount of the Premium to be competed for.

5. The Competitions (except for Horses) must take place between the 1st of April and the 26th of October, and are open to all parties within the District, whether members of the local Association or not.

6. The Committee shall select the breed, and specify it in the returns.

In Cattle the animals exhibited must belong to one of the following pure breeds—Short-horn, Ayrshire, Polled (Galloway, Angus, or Aberdeen), Highland. The Bulls may be of one breed, and the Heifers of another. In Sheep, the breeds must be Leicester, Cheviot, or Blackfaced.

7. Stock of an inferior description, or which does not fall within the prescribed regulations, shall not be placed for competition.

8. The Premiums shall not be divided. In Cattle, Horses, Sheep, and Swine, five lots in each Class will warrant the award of full, and three lots of half, Premiums. In Dairy Produce, eight Exhibitors in any one Class will warrant an award of full, and four of half, Premiums. A Competitor may exhibit two lots in each class, except in Dairy Produce, where only one lot is allowed from the same farm. For the Silver Medal to former first prize animals two lots are required. To authorise the award of the Medals in the intermediate year, there must be not less than two lots in each Class. No animal to be allowed to compete in more than one section.

9. The Premiums are open to General Competition to all within the boundaries of the District of the local Society.

10. An animal which has gained the Highland and Agricultural Society's first Money Premium at a previous District or General Show is inadmissible in the same Class (except in the case of Stallions); and one which has gained a second Money Premium can only thereafter compete in that Class for the first.

11. A Bull the property of two or more Tenants may compete, although the Exhibitors may not be Joint-Tenants.

12. Bulls for which Money Premiums are awarded may be required to serve in the District at least one season; the rate of service to be fixed by the Committee, and the prizes may be withheld till the conditions are fulfilled. Premiums for the Heifers may be retained till the animals are certified to have calved.

13. Evidence must be produced that the Prize Stallions have had produce.

14. Mares must have foals at foot (except when death of foal is certified), or be entered as being in foal; in the latter case payment of the Premiums will be deferred till certificate of birth, which must be within 11 months from the date of the Show.

15. All Prize Tups must serve within the District during the season following the Competition. Ewes and Gimmers must be taken from the Exhibitor's stock, and must have been bred by him in the District; and Ewes must have reared Lambs during the season. Fleeces must not be artificially coloured.

16. Should it be proved to the satisfaction of the Committee that an animal has been entered under a false name, pedigree, or description, for the purpose of misleading the Committee or Judges as to its qualifications or properties, the case shall be reported to the Directors, and submitted by them to the first General Meeting, in order that the Exhibitor may be disqualified from again competing for the Society's Premiums, and his name, if he is a member, struck from the roll, or his case otherwise disposed of as the Directors may determine.

17. When an animal has previously been disqualified by the decision of any Agricultural Association in Great Britain or Ireland, such disqualification shall attach, if the Exhibitor, being aware of the disqualification, fail to state it and the grounds thereof, in his entry, to enable the Committee to judge of its validity.

18. Competitors must certify that the Butter and Cheese exhibited by them are average specimens of the produce of their dairies in 1880, and that the quantity produced during the season has not been less than 1 cwt. of Butter, or 2 cwt. of Cheese.

19. It is to be distinctly understood that in no instance does any claim lie

against the Highland and Agricultural Society for expenses attending a show of stock beyond the amount of the Premiums offered.

20. Blank reports will be furnished to the Conveners and Secretaries of the different Districts. These must, in all details, be completed, and lodged with the Secretary *on or before the 1st of November next*, for the approval of the Directors, against whose decisions there shall be no appeal.

21. A report of the Competitions and Premiums awarded at the *intermediate* local shows in the several Districts for Cattle and Sheep, signed by a member of the Society, must be transmitted to the Secretary *on or before the 1st of November in each year*, otherwise the Society's grants shall terminate.

22. When a grant has expired, the District cannot apply again for aid for two years.

Section 6.—SPECIAL GRANTS.

£50 and Medium Gold Medal to the Edinburgh Christmas Club.—*Secretary*, Hugh Martin, 7 Hope Street, Edinburgh. Granted 1867.

£50 to Glasgow Agricultural Society.—*Secretary*, Mark Marshall, 145 St Vincent Street, Glasgow.

£20 to the Ayrshire Agricultural Association, to be competed for at the Dairy Produce Show at Kilmarnock.—*Convener*, The Hon. G. R. Vernon, Auchans House, Kilmarnock ; *Secretary*, James M'Murtrie, Ayr. Granted 1872.

£3 to Westray Society for three alternate years.—*Convener* and *Secretary*, Thomas Traill of Holland, Kirkwall. Granted 1876.

£3 to Egilshay Society for three consecutive years.—*Secretary*, Thomas Garson, Grougar, Egilshay, Orkney. Granted 1879.

£3 to Unst Society for five consecutive years.—*Convener* and *Secretary*, Alex. Sandison, Uyasound, Unst. Granted 1879.

Section 7.—MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

The Society, being anxious to co-operate with local Associations, will give a limited number of Medium Silver Medals annually to Societies, not on the list of Cattle or Sheep Premiums, in addition to the Money Premiums awarded in the District for—

1. Best Bull, Cow, Heifer, or Ox.
2. Best Stallion, Mare, or Gelding.
3. Best Tup, or Pen of Ewes or Wethers.
4. Best Boar, Sow, or Pig.
5. Best Coops of Poultry.
6. Best sample of any variety of Wool.
7. Best sample of any variety of Seeds.
8. Best managed Farm.
9. Best managed Green Crop.
10. Best managed Hay Crop.
11. Best managed Dairy.
12. Best Sweet Milk Cheese.
13. Best Cured Butter.
14. Best collection of Roots.
15. Best kept Fences.

16. Male Farm Servant who has been longest in the same service, and who has proved himself most efficient in his duties, and to have invariably treated the animals under his charge with kindness.
17. Female Servant in charge of Dairy and Poultry who has been longest in the same service, and who has proved herself most efficient in her duties, and to have invariably treated the animals under her charge with kindness.
18. Best Sheep Shearer.
19. Most expert Hedge Cutter.
20. Most expert Labourer at Draining.
21. Most expert Farm-Servant at trial of Reaping Machines.
22. Best Maker of Oat Cakes.

It is left to the local Society to choose out of the foregoing list the classes for which the Medals are to be competed.

The Medals are given for five consecutive years.

Aberdeenshire.

1. Donside Club.—*Convener*, Sir William Forbes of Craigievar, Bart.-Fintray House, Aberdeen; *Secretary*, James Rennie, Miltown of Fintray, Aberdeen. 2 Medals. Granted 1877.
2. Formartine Root Association.—*Convener*, Captain Alexander C. Hunter of Tillery, Aberdeen; *Secretary*, Thomas Duguid, Mosshead, Udny, Aberdeen. 2 Medals. Granted 1879.
3. Fyvie Association.—*Convener*, ; *Secretary*, James Ironside, Burnside, Fyvie. 2 Medals. Granted 1880.
4. Garioch Turnip Growing Association.—*Convener*, Henry Gordon of Manar, Inverurie; *Secretary*, James Stephen, Conglass, Inverurie. 2 Medals. Granted 1878.
5. Inverurie Association.—*Convener*, Henry Lumsden of Pitcaple, Pitcaple; *Secretary*, James Stephen, Conglass, Inverurie. 2 Medals. Granted 1878.
6. Kinellar Horticultural and Poultry Association.—*Convener*, Colonel William Ross King of Tertowie, Kinellar, Aberdeen; *Secretary*, Alexander Taylor, Fichnie, Kinellar, Aberdeen. 2 Medals. Granted 1879.
7. Leochel-Cushnie Society.—*Convener*, Sir William Forbes of Craigievar, Bart., Fintray House, Aberdeen; *Secretary*, James Strachan, Wester Fowlis, Alford. 3 Medals. Granted 1879.
8. New Aberdour Society.—*Convener*, James Cruickshank, Ladysford, Fraserburgh; *Secretary*, Alexander Rae, Killyquharn, Aberdour, Fraserburgh. 5 Medals. Granted 1878.
9. North-East Aberdeenshire Society.—*Convener*, Sir Alexander Anderson, Aberdeen; *Secretary*, G. A. Cruickshank, Nether Cortes, Lonmay. 6 Medals. Granted 1880.

Argyllshire.

10. Lismore Society.—*Convener*, Major James Ross, United Service Club, Edinburgh; *Secretary*, Dugald M'Intyre, Frackersaig, Lismore. 2 Medals. Granted 1878.
11. Lochbuy Society.—*Convener*, M. G. Maclaine of Lochbuy, Oban; *Secretary*, Donald M'Phail, Cameron Farm, Mull, Oban. 2 Medals. Granted 1876. (Three years in abeyance.)
12. West of Mull Association.—*Convener*, H. H. Pitcairn, Tiroran House, Mull, Oban; *Secretary*, Hector A. Campbell, Ardfenaig, Bunessan. 2 Medals. Granted 1880.

Ayrshire.

13. Ardrossan Society.—*Convener*, D. Cuninghame, Chapelton, Ardrossan; *Secretary*, James Campbell, Writer, Saltcoats. 2 Medals. Granted 1877.
14. Cumnock Society.—*Convener*, James Murray, jun., Dumfries Arms Hotel, Cumnock; *Secretary*, John Hayman, Dumfries House Mains, Old Cumnock. 2 Medals. Granted 1877.
15. Dalry Society.—*Convener*, Andrew Allan, Munnoch, Dalry; *Secretary*, Robert Craig, Flashwood, Dalry. 4 Medals. Granted 1879.
16. Dalrymple Society.—*Convener*, Alex. Smith, Barnford, Dalrymple, Ayr; *Secretary*, William Clark, Schoolhouse, Dalrymple, Ayr. 2 Medals. Granted 1876.
17. Darvel Horticultural Society.—*Convener*, John Nisbet, Longgreen, Newmilns, Kilmarnock; *Secretary*, Peter Gorrie, Public School, Darvel, Kilmarnock. 2 Medals. Granted 1876.
18. Dundonald Society.—*Convener*, The Hon. G. R. Vernon, Auchans House, Kilmarnock; *Secretary*, John Caldwell, Bogside, Dundonald. 3 Medals. Granted 1878.
19. Galston Society.—*Convener*, Alex. D. Tait of Milrig, Kilmarnock; *Secretary*, Robert Hendrie, Drumdroch, Galston. 3 Medals. Granted 1877.
20. Galston Horticultural Society.—*Convener*, Robert Mackie, Loudoun Cottage, Galston; *Secretary*, Thomas Paterson, Galston. 3 Medals. Granted 1880.
21. Loudoun and Lanfine Society.—*Convener*, Robert Mackie, Loudoun Cottage, Galston; *Secretary*, Andrew Cameron, Newmilns, Kilmarnock. 4 Medals. Granted 1879.
22. Sorn Parish Association.—*Convener*, Charles Howatson of Dornel, Daldorch House, Mauchline; *Secretary*, Thomas Aitkin, St Germain Street, Catrine, Mauchline. 4 Medals. Granted 1876.
23. Sorn and Dalgain Society.—*Convener*, Graham Somervell of Sorn, Mauchline; *Secretary*, Robert Brown, Dalgain, Sorn, Mauchline. 5 Medals. Granted 1879.
24. Stewarton Society.—*Convener* and *Secretary*, John Lindsay, Thornhill, Stewarton. 2 Medals. Granted 1877.
25. Tarbolton Society.—*Convener*, W. S. Cooper, yr. of Failford, New Club, Edinburgh; *Secretary*, Wm. Candlish, Middlemuir, Tarbolton. 2 Medals. Granted 1878.
26. West Kilbride Society.—*Convener*, John Crawford, Milstonford, West Kilbride; *Secretary*, Thomas Wilson, Drummilling, West Kilbride. 5 Medals. Granted 1879.

Banffshire.

27. Spey, Avon, and Fiddochside Society.—*Convener*, Sir George Macpherson Grant of Ballindalloch, Bart.; *Secretary*, Wm. Robertson, Burnside, Ballindalloch. 4 Medals. Granted 1877.

Buteshire.

28. Bute Society.—*Convener*, Henry Stuart, Montford, Rothesay; *Secretary*, W. A. Wilson, County Office, Rothesay. 3 Medals. Granted 1878.

Dumbartonshire.

29. Cumbernauld Society.—*Convener*, John William Burns of Kilmahew, Dumbarton; *Secretary*, George Anderson, Lochgreen House, Bonnybridge. 3 Medals. Granted 1876.

30. Western District of Dumbartonshire.—*Convener*, Sir James Colquhoun of Luss, Bart., Ross-dhu, Luss; *Secretary*, Major James Colquhoun, Ben Cruach Lodge, Arroquhar. 2 Medals. Granted 1879.

Dumfriesshire.

31. Sanquhar Society.—*Convener*, John Gilchrist Clark of Speddoch, Dabton, Thornhill; *Secretary*, W. O. Macqueen, Sanquhar. 5 Medals. Granted 1878.

Edinburghshire.

32. Western District of Mid-Lothian Association.—*Convener*, James Paterson of Bankton, Mid-Calder; *Secretary*, James H. Steuart, Selms, Kirknewton. 4 Medals. Granted 1878.

Inverness-shire.

33. Glen Urquhart Society.—*Convener*, The Earl of Seafield; *Secretary*, John Kennedy, Pitkerrold, Glen Urquhart. 3 Medals. Granted 1877.

34. Northern Counties Fat Show Club.—*Convener*, Lord Lovat, Beaufort Castle, Beauly; *Secretary*, John Cran, Kirkton, Inverness. 6 Medals. Granted 1878.

35. Strathglass Society.—*Convener*, Lord Lovat, Beaufort Castle, Beauly; *Secretary*, James Fraser, Mauld, Beauly. 2 Medals. Granted 1876.

Kincardineshire.

36. Fettercairn Club.—*Convener*, Col. M'Inroy of The Burn, Brechin; *Secretary*, William Crichton, Castleton of Kincardine, Laurencekirk. 3 Medals. Granted 1878.

Lanarkshire.

37. Cadder Society.—*Convener*, Alexander Campbell, Crosshill, Bishopbriggs; *Secretary*, J. Stewart, 4 Parliamentary Road, Glasgow. 2 Medals. Granted 1877.

38. Carnwath Society.—*Convener*, Hector F. M'Lean, Carnwath House; *Secretary*, George Russell, Carnwath. 4 Medals. Granted 1878.

39. Carmichael Society.—*Convener*, Sir Windham C. J. Carmichael Anstruther, Bart., M.P., Carmichael House, Thankerton; *Secretary*, William Bell, Sheriffflats, Thankerton. 2 Medals. Granted 1877.

40. Stonehouse Association.—*Convener*, J. P. Alston of Muirburn, Glassford; *Secretary*, Wm. Wallace, 145 Nelson Street, Glasgow. 2 Medals. Granted 1878.

Orkney.

41. Rousay Society.—*Convener*, Col. Boroughs of Rousay, Orkney; *Secretary*, Wm. Seatter, Saviskaill, Rousay. 2 Medals. Granted 1878.

Perthshire.

42. Culross Society.—*Convener*, John J. Dalgleish of West Grange; *Secretary*, Wm. Clark, Pitfirrane Estate Office, Dunfermline. 3 Medals. Granted 1879.

43. Dunning Horticultural Society.—*Convener*, James Fenwick, Leadketty, Dunning; *Secretary*, Johnstone Wright, Dunning. 2 Medals. Granted 1880.

44. Middle District of Athole and Tullymet.—*Convener*, Wm. Dick of Tullymet, Ballinluig; *Secretary*, John S. Grant, Tullymet, Ballinluig. 1 Medal. Granted 1878.

45. Stormont Union Society.—*Convener*, Sir Alex. Muir Mackenzie of Delvine, Bart.; *Secretary*, Robert Grant, Pleasance, Coupar Angus. 5 Medals. Granted 1880.

46. Strathearn Ornithological Society.—*Convener*, C. H. Dundas, Gerrichrew, Dunira, Crieff; *Secretary*, James M'Laren, jun., Crieff. 2 Medals. Granted 1880.

Renfrewshire.

47. Eaglesham Society.—*Convener*, William Gillies, Writer, Pollokshaws; *Secretary*, Wm. Dykes, Polnoon Mains, Eaglesham. 1 Medal. Granted 1878.

48. Neilston Society.—*Convener*, John Holm, Jaapston, Neilston; *Secretary*, A. Robertson Ferguson, Clydesdale Bank, Neilston. 2 Medals. Granted 1876.

Ross-shire.

49. Black Isle Society.—*Convener*, James Fletcher of Rosehaugh, Avoch; *Secretary*, James R. Mitchell, Drynie, Inverness. 3 Medals. Granted 1879.

50. Wester Ross Club.—*Convener*, Sir Kenneth S. Mackenzie of Gairloch, Bart., Conan House, Dingwall; *Secretary*, David Ross, Banker, Dingwall. 4 Medals. Granted 1877.

Stirlingshire.

51. Campsie, Strathblane, and Baldernock Society.—*Convener*, Sir Charles E. F. Stirling of Glorat, Bart., Milton of Campsie; *Secretary*, James Slimmon, Balcorrach, Campsie. 2 Medals. Granted 1879.

52. Gargunnock Society.—*Convener*, Sir Henry J. Seton Steuart of Allanton, Bart., Stirling; *Secretary*, Thomas Leishman, 25 Park Terrace, Stirling. 2 Medals. Granted 1877.

53. Kilsyth Society.—*Convener*, James Patrick, Queenzieburn, Milton of Campsie; *Secretary*, R. M. Lennox, Victoria Place, Kilsyth. 2 Medals. Granted 1880.

The Medals are given for five consecutive years.

Applications from other Districts must be lodged with the Secretary of the Society *by 1st November next.*

RULES OF COMPETITION.

1. All Competitions must be at the instance of a local Society.

2. The classes for which Medals are granted must be in accordance with the list at page 40. The Committee shall select the classes, and specify them in the return.

3. In each District the Convener (who must be a member of the Society appointed by the Directors) shall fix the time and place of Competition, appoint the Judges, and make all other necessary arrangements, in concurrence with the other Members of the Society, and the local Association of the District.

4. The Money Premiums given in the District must be £2 for each Medal claimed.

5. The Medal for Sheep Shearing shall not be awarded unless there are three competitors, and it shall always accompany the highest Money Premium. There must not be fewer than two competitors in all the classes.

6. Blank reports will be furnished to all the Conveners of the different Districts. These must, in all details, be completed and lodged with the

Secretary *on or before the 1st of November next*, with the exception of green crop reports, which must be forwarded on or before the 20th of December, for the approval of the Directors, against whose decisions there shall be no appeal.

7. When a grant has expired, the District cannot apply again for aid for two years.

Section 8.—PLOUGHING COMPETITIONS.

The Minor Silver Medal will be given to the winner of the first or highest Premium at Ploughing Competitions, provided a Report in the following terms is made to the Secretary, within one month of the Competition, by a Member of the Society :—

FORM OF REPORT.

I of Member of the Highland and Agricultural Society, hereby certify that I attended the Ploughing Match of the Association at in the county of on the when ploughs competed ; of land was assigned to each, and hours were allowed for the execution of the work. The sum of £ was awarded in the following proportions, viz. :—

[Here enumerate the names and designations of successful Competitors.]

RULES OF COMPETITION.

1. All Matches must be at the instance of a local Society or Ploughing Association, and no Match at the instance of an individual, or confined to the tenants of one estate, will be recognised.

2. The title of such Society or Association, together with the name and address of the Secretary, must be registered with the Secretary of the Highland and Agricultural Society, 3 George IV. Bridge, Edinburgh.

3. Not more than one Match in the same season can take place within the bounds of the same Society or Association.

4. All reports must be lodged within one month of the date of the Match, and certified by a Member of the Highland and Agricultural Society who was present at it.

5. A Member can only report one Match, and a Ploughman cannot carry more than three Medals in the same season.

6. To warrant the grant of the Medal there must have been twelve ploughs in Competition, and Three Pounds awarded in Premiums by the local Society. The Medal to be given to the winner of the first or highest prize.

7. Ploughmen shall not be allowed any assistance, and their work must not be set up nor touched by others ; on land of average tenacity the ploughing should be at the rate of an imperial acre in ten hours, and attention should be given to the firmness and sufficiency of the work below, more than to its neatness above the surface.

CLASS III.

COTTAGES AND GARDENS.

The following Premiums are offered for Competition in the Parishes after mentioned.

The Premiums for Cottages and Gardens are given for five consecutive years.

SECTION I.—PREMIUMS FOR BEST KEPT COTTAGES AND GARDENS.

1. Best kept Cottage—One Pound; and where there are four Competitors—Minor Silver Medal.
   Second best—Ten Shillings.
   Third best—Minor Silver Medal.
2. Best kept Cottage Garden—One Pound; and where there are four Competitors—Minor Silver Medal.
   Second best—Ten Shillings.
   Third best—Minor Silver Medal.

Aberdeenshire.

1. METHLICK HORTICULTURAL SOCIETY.—*Convener*, John Grant, Banker, Methlick; *Secretary*, James Allan, Methlick. Granted 1877.

Argyllshire.

2. OBAN.—*Convener*, Neil Macdonald of Dunach, Oban; *Secretary*, Donald Macgregor, Solicitor, Oban. Granted 1880.

Edinburghshire.

3. CALDERS UNION HORTICULTURAL SOCIETY.—*Convener*, R. G. Smith, Georgeville, Mid-Calder; *Secretary*, James B. Smith, Greenloan Cottage, Kirknewton. Granted 1878.

Fifeshire.

4. NORTH OF FIFE HORTICULTURAL SOCIETY.—*Convener*, John Mitchell, Fliskmillan, Cupar Fife; *Secretary*, George S. Leslie, teacher, Luthrie, Cupar Fife. Granted 1878.

Kincardineshire.

5. MEARNS AMATEUR HORTICULTURAL SOCIETY.—*Convener*, William Alexander, Bent, Laurencekirk; *Secretary*, James Burgess, Laurencekirk. Granted 1878.

Linlithgowshire.

6. DALMENY AND QUEENSFERRY HORTICULTURAL SOCIETY.—*Convener*, Peter Glendinning, Leuchold, Dalmeny Park, Edinburgh; *Secretary*, John Allan, Dalmeny Park, Edinburgh. Granted 1879.

Perthshire.

7. Braco Horticultural Society.—*Convener*, John Kinross, Gannochan, Braco; *Secretary*, George Dingwall, Ardoch Gardens, Braco. Granted 1878.
8. Forgandenny.—*Convener*, T. T. Oliphant of Rossie, Bridge of Earn; *Secretary*, A. M. Nicholson, Craigbank, Forgandenny, Bridge of Earn. Granted 1877.
9. Muthill Horticultural Society.—*Convener*, Henry Curr, Pitkellony, Muthill; *Secretary*, Malcolm Finlayson, Pitkellony Office, Muthill. Granted 1877.

Stirlingshire.

10. Killearn Society.—*Convener*, David Edmond of Ballochruin, Balfron; *Secretary*, Robert King, Boquhan, Killearn. Granted 1879.

Sutherlandshire.

11. Skibo Association.—*Convener*, Evan C. Sutherland Walker of Skibo, Skibo Castle, Sutherland; *Secretary*,
Granted 1879.

Wigtownshire.

12. Inch.—*Convener*, Earl of Stair, K.T., Lochinch, Castle Kennedy, Wigtownshire; *Secretary*, Thomas C. Greig, Rephad, Stranraer. Granted 1879.

RULES OF COMPETITION.

1. Competitions may take place in the different parishes for Cottages and Gardens, or for either separately.

2. The occupiers of Lodges at Gentlemen's Approach Gates and Gardener's Houses are excluded, as well as others whom the Committee consider, from their position, not to be entitled to compete. The inspection must be completed by the 1st of October. In making the inspection, the Conveners may take the assistance of any competent judges.

3. It is left to the Committee of the district to regulate the maximum annual rent of the Cottages, which may, with the garden, be from £5 to £7.

4. A person who has gained the highest Premium cannot compete again, but will be entitled to a Medal if certified by the Committee to be equal in merit to the first on the list of Competitors.

5. If the Cottage is occupied by the proprietor, the roof must be in good repair; if the roof is thatch, it must be in good repair, though in the occupation of a tenant. The interior and external conveniences must be clean and orderly—the windows must be free of broken glass, clean, and affording the means of ventilation. Dunghills, and all other nuisances, must be removed from the front and gables. In awarding the Cottage Premiums, preference will be given to Competitors who, in addition to the above requisites, have displayed the greatest taste in ornamenting the exterior of their houses, and the ground in front and at the gables.

6. In estimating the claims for the Garden Premiums, the judges should have in view:—The sufficiency and neatness of the fences and walks; the cleanness of the ground; the quality and choice of the crops; and the general productiveness of the garden.

7. Reports, stating the number of Competitors, the names of successful parties, and the nature of the exertions which have been made by them,

must be transmitted by the Conveners to the Secretary *on or before the* 1*st November next.*

8. When a grant has expired, the District cannot apply again for aid for two years.

Parishes desirous of these Premiums must lodge applications with the Secretary *on or before the* 1*st November next.*

Section 2.—MEDALS FOR COTTAGES AND GARDENS OR GARDEN PRODUCE.

The Society will issue annually two Medium Silver Medals to a limited number of local Associations or individuals, who at their own expense establish Premiums for Cottages or Gardens under £15 of Rent. The Medals may be awarded for best kept Cottage, and best kept Garden or Flower Plot, or Garden Produce.

Local Associations or individuals desirous of these Medals, must lodge applications with the Secretary *on or before the* 1*st November next.* The Medals are given for five consecutive years.

Dumbartonshire.

1. Vale of Leven and Dumbarton Horticultural Society.—*Convener*, J. M. Martin, yr. of Auchendennan, Bloomhill, Cardross ; *Secretary*, Robert Warnock, 88 Bridge Street, Alexandria, N.B. Granted 1879.

Fifeshire.

2. Dysart Horticultural Society.—*Convener*, James T. Oswald of Dunnikier, Kirkcaldy ; *Secretary*, John Watson, Orchard House, Dysart. Granted 1877.
3. Kirkcaldy Horticultural Society.—*Convener*, William Drysdale of Kilrie, Kinghorn ; *Secretary*, John Leslie, West Mills, Kirkcaldy. Granted 1880.

Inverness-shire.

4. Badenoch and Rothiemurchus Horticultural Society.—*Convener*, Cluny Macpherson, Cluny Castle, Kingussie ; *Secretary*, William Forrest, Kingussie. Granted 1876.

Kincardineshire.

5. Fordoun, Glenbervie, and Arbuthnot Horticultural Society.—*Convener*, Lord Inverurie, Inglismaldie Castle, Laurencekirk ; *Secretary*, Alexander Cruickshank, gardener, Glenbervie, Fordoun. Granted 1876.

Lanarkshire.

6. Albert Gardens Association, Glasgow.—*Secretary*, George D. Miller, 16 Mathieson Street, Glasgow. Granted 1877.
7. Bothwell Horticultural Society.—*Convener*, Dr Bruce Goff, Woodlea, Bothwell ; *Secretary*, Robert Horne, Schoolhouse, Bothwell. Granted 1876.
8. Carnwath Horticultural Society.—*Convener*, George Russell, Carnwath ; *Secretary*, David Aitken, Carnwath. Granted 1880.

9. New Victoria Gardens, Lily Bank Road, Glasgow.—*Secretary*, James Culley, 2 Viewfield Terrace, Pollockshields. Granted 1878. (One year in abeyance.)
10. Saracen Public Gardens, Possil Park, Glasgow.—*Convener*, Walter Macfarlane, 22 Park Circus, Glasgow; *Secretary*, William Manson, 94 Hawthorn Street, Possil Park, Glasgow. Granted 1879.

Nairnshire.

11. Auldearn Flower Show.—*Convener*, J. C. J. Brodie of Lethen, Nairn; *Secretary*, James Carson, Auldearn, Nairn. Granted 1880.

Perthshire.

12. Blairgowrie and Rattray Horticultural Society.—*Convener*, John Anderson, Royal Hotel, Blairgowrie; *Secretary*, Henry Dryerre, Croft House, Blairgowrie. Granted 1880.
13. Breadalbane, Weem, Strathtay, and Grandtully Horticultural Society—*Convener*, E. O. Douglas of Killiechassie, Aberfeldy; *Joint-Secretaries*, D. Macdiarmid, Bank of Scotland, Aberfeldy, and Peter Haggart, Aberfeldy. Granted 1879.
14. Dunkeld and Birnam Horticultural and Poultry Association.—*Convener*, John Macgregor, Ladywell, Dunkeld; *Secretary*, Robert Robertson, Ladywell, Dunkeld. Granted 1880.
15. Logiealmond and Glenalmond Horticultural Society.—*Convener*, Graeme R. Mercer of Gorthie, Glen Tulchan House, Perth; *Secretary*, Daniel Paton, Woodburn Cottage, Harrietfield, Perth. Granted 1878.

REGULATIONS.

1. Competitions may take place in the different districts for Cottages and Gardens, or for either separately.
2. The annual value of each Cottage, with the ground occupied in the parish by a Competitor, must not exceed £15.
3. If Competition takes place for Garden Produce in place of the best kept Garden, such produce must be *home fish* grown in the Exhibitor's Garden, and he will not be allowed to make up a collection from any other Garden.
4. Blank reports will be furnished to the Conveners and Secretaries of the different Districts. These must, in all details, be completed and lodged with the Secretary *on or before the 1st November next*, for the approval of the Directors, against whose decisions there shall be no appeal.
5. When a grant has expired, the District cannot apply again for aid for two years.

Section 3.—IMPROVING EXISTING COTTAGES.

To the Proprietor in Scotland who shall report the Improvement of the greatest number of Cottages during the years 1877, 1878, and 1879—The Gold Medal.

Section 4.—BUILDING NEW COTTAGES.

To the Proprietor in Scotland who shall report the Erection of the greatest number of approved Cottages during the years 1876, 1877, 1878, and 1879—The Gold Medal.

RULES OF COMPETITION.

1. Claims for the Premiums Nos. 3 and 4 must be lodged with the Secretary on or before the 1st of October next, to allow an inspection to be made of the different Cottages. The inspection will be conducted by a Committee of the Society's Members, and Reports must be transmitted to the Secretary *on or before the 1st November next.*

2. The annual value of the Cottage or Cottages separately, with the garden ground, must not exceed £5.

3. In estimating the claims of the Competitors, the following points will be kept in view :—The external appearance of the Cottages ; their internal accommodation ; the arrangements of the out-houses ; the means of drainage and ventilation ; and the expense of the building or of the alteration, compared with its durability and accommodation. When the Cottages of one Competitor are superior in style and comfort to those of another, though not so numerous, the Inspectors will give them preference, provided they amount at least to three, and have been erected at a moderate expense.

4. Parties competing will forward to the Society Plans, Specifications, and Estimates, of which, and of all information sent therewith, copies may be taken for publication, if the Society shall see fit, and the originals returned to the parties within six months, if desired.

HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

GENERAL SHOW OF STOCK AND IMPLEMENTS

AT

KELSO

ON 27TH, 28TH, 29TH, AND 30TH JULY 1880.

President of the Society.

THE MOST NOBLE THE MARQUIS OF LOTHIAN, K.T.

Chairman of the Local Committee.

SIR GEORGE H. SCOTT DOUGLAS OF SPRINGWOOD PARK, BART., M.P.

The District connected with the Show comprises the Counties of Berwick, Roxburgh, Selkirk, and Peebles.

REGULATIONS.

GENERAL CONDITIONS.

1. The Competition is open to Exhibitors from all parts of the United Kingdom. New Members may be proposed for election at the General Meeting in June, and, if on the list of Candidates, may enter at Members' rates; but all entries must be made on or before 4th June for implements, and 11th of June for stock and other entries.*

2. Every Lot must be intimated by a Certificate of Entry, lodged with the Secretary *not later than the 4th of June for Implements, and 11th of June for Stock and other Entries.* Printed forms will be issued on application to the Secretary, No. 3 George IV. Bridge, Edinburgh. Admission Orders will be forwarded to Exhibitors, by post, previous to the Show.

3. Protests against the awards of the Judges must be lodged with the Secretary not later than 9 A.M. on Wednesday, 28th July, and parties must be in attendance at the Committee-Room, in the Show-Yard, at 10 A.M. that day, when protests will be disposed of.

4. Protests lodged for causes which the protestor produces no good evidence to substantiate, will render him liable to be reported to the Board of Directors, with the view, if they see reason, to his being prohibited from again entering stock for a General Show.

5. The Society shall not be liable for any loss or damage which Stock, Poultry, Implements, or other articles may sustain at the Show, or in transit.

6. The decisions of the Board of Directors are final in all questions respecting Premiums and all other matters connected with the Show, and it shall not be competent for any Exhibitor to appeal against such decisions to, nor seek redress in respect of them from, any other tribunal.

7. Covered Booths for Offices (9 feet by 9 feet), purely for business, not for exhibition of goods, can be had for £3, 10s. to Members, and £5 to Non-Members. Intimation to be made to the Secretary before the 1st of July.

8. No lights allowed in the Yard at night, and Smoking is strictly prohibited within the sheds. Those infringing this Rule will be fined 10s.

9. As the command of water in the Yard is limited, it is particularly requested that waste be avoided.

10. When the ground requires to be broken, the turf must be carefully lifted and laid aside, and the surface must be restored to the satisfaction of the Society, and at the expense of the Exhibitor.

* According to the Charter, a Member who homologates his Election by paying his first subscription cannot retire until he has paid, in annual subscriptions or otherwise, an amount equivalent to a life composition. Firms are not elected as Members, but if one Partner of a Firm becomes a Member, the Firm is allowed all the privileges of Membership in the way of exhibiting at reduced rates.

11. All persons admitted into the Show-Yard shall be subject to the Rules and Orders of the Directors.

12. The violation by an Exhibitor of any one of the Regulations will involve the forfeiture of all Premiums awarded to him, or of such a portion as the Directors may ordain.

13. Railway Passes for unsold stock and implements must be applied for at the Committee Room in the Yard between 9 and 11 o'clock on the forenoon of Thursday and Friday.

14. The Show terminates at 5 P.M. on Friday, 30th July, and no animals or article can be withdrawn before that hour. Stock and Implements may remain in the Yard till Saturday afternoon.

15. The Premiums awarded will be paid in November 1880, and, with the exception of the Tweeddale Gold Medal and the Silver Medals, may be taken either in money or in plate.

STOCK AND POULTRY.

16. Stock and Poultry to be entered with the Secretary on or before the 11th day of June. Received in the Yard on Monday, 26th, and till 10 A.M. on Tuesday, 27th July. Judged at 11 A.M. on Tuesday. Exhibited on Tuesday, Wednesday, Thursday, and Friday, 27th, 28th, 29th, and 30th July.

17. All animals must be entered in the sections applicable to their ages, and cannot be withdrawn after entry. No animal to be allowed to compete in more than one section, except Horses in Sections 13, 14, and 15, which may be also entered in Section 16.

18. Shorthorn animals must be entered in the herd book, or the exhibitor must produce evidence that his animal is eligible to be entered therein.*

19. Stock must be *bona fide the property and in the possession of* the Exhibitor from the 11th June (the last day of Entry).

20. The schedule of Entry must be filled up so far as within the knowledge of the Exhibitor.

21. The name of the Breeder, if known, must be given, and if the Breeder is not known a declaration to that effect, signed by the Exhibitor, must be sent along with the Schedule, and no pedigree will be entered in the Catalogue when the Breeder is unknown.

22. Should it be proved to the satisfaction of the Directors that an animal has been entered under a false name, pedigree, or description, for the purpose of misleading the Directors or Judges as to its qualification or properties, the case shall be reported to the first General Meeting, in order that the Exhibitor shall be disqualified from again competing at the Society's Shows, and his name, if he be a Member, struck from the roll, or his case otherwise disposed of as the Directors may determine.

23. An animal which has gained a first premium at a General Show of the Society cannot again compete in the same section.

24. When an animal has previously been disqualified by the decision of any Agricultural Association in Great Britain or Ireland, such disqualification shall attach, if the Exhibitor, being aware of the disqualification, fail to state it, and the grounds thereof, in his entry, to enable the Directors to judge of its validity.

25. Breeding Stock must not be shown in an improper state of fatness, and the Judges will be prohibited from awarding Premiums to overfed animals.

26. The Competition of Stallions for agricultural purposes is held in spring.

27. No animal shall bear on its rug, harness, pail, or other fittings, any initial, crest, or mark of ownership, nor be distinguished otherwise than by the number indicating its place in the Catalogue.

28. Any artificial contrivance or device of any description found on an animal either for preventing the flow of milk or for any other purpose, will

* It is the intention of the Society to extend this rule to Galloways at the Stirling Show in 1881.

disqualify that animal from being awarded a Premium, and the Owner of said animal will be prohibited from again entering stock for any of the Society's General Shows, or for such a period as the Directors may see fit.

29. Exhibitors shall be answerable for all acts, whether committed by themselves, their servants, or others, and shall be responsible for the condition of their animals during the whole time they remain in the Show-Yard.

30. No animal to be taken out of its stall after 10 A.M. during the Show, except by order of the Judges, or with permission of the Secretary. Those infringing this Rule will be fined 10s.

31. Aged Bulls and Stallions must have had produce, and, along with Two-year-old Bulls and Three-year-old Colts, have entered into the year of the Show.

32. All Cows must have had calves previous to the Show, and when exhibited, they must either be in milk or in calf; if in milk, birth must have been within 9 months of the Show; if in calf, birth must be certified within 9 months after the Show. In the case of Ayrshire Heifers in Calf, calved before 1st January 1879, birth must be certified within 9 months after the Show.

33. All Milch Cows must have been milked dry the evening previous to being judged, and they must, while within the Show-Yard, be milked morning and evening. The Judges will be instructed to withhold the prizes from any animals overstrained or suffering from want of being milked.

34. Two-year-old Heifers—of the Short-horn and Polled Breeds—must be in calf when exhibited, and the premiums will be withheld till birth be certified, which must be within 9 months after the Show. Animals of any age that have had a calf must be shown as Cows.

35. Mares in Sections 5 and 12 must have produced foals after 1st January 1880, and foals must be at foot, except when death can be proved. Mares in Section 6 must be in foal, and awards will be suspended till birth is certified, which must be within 11 months from the date of the Show.

36. With reference to regulations 32 and 34, birth of at least a seven months' calf must be certified; and in regard to regulation 35, birth of at least a nine months' foal.

37. Horses entered as suitable for Field are expected to be jumped in the Horse Ring, but this is not compulsory except when the animals are being judged, and then only if required by the Judges. Those entered for leaping must be jumped in the Horse-Ring at each Parade during the Show.

38. The inspection of Horses as to soundness is left entirely to the Judges, who may consult the Society's Veterinary Surgeon if they deem it expedient.

39. No protests on veterinary grounds will be received.

40. All Ewes must have reared Lambs in 1880; and Ewes in Sections 4 and 9 (Cheviot and Blackfaced) must be in milk, and have their Lambs at foot. Fleeces must not be artificially coloured.

41. Sows must have reared pigs in 1880, or be in pig; and Pigs must belong to the same litter, and be uncut.

42. In Poultry the Aged Birds must have been hatched previous to, and Cockerels and Pullets in, 1880. No dubbing is allowed in the male birds of the Game Breeds. In the sections for Ducks, Turkeys, Geese, and Hens and Pullets of the Game and Malay Breeds, the lots to consist of one bird only.

43. The Yard will be open for Stock on Monday, 26th July, and between Six and Ten o'clock on the morning of Tuesday, 27th, after which hour no Stock can be admitted.

44. Bulls must be secured by nose rings, with chains or ropes attached, or with strong halters and double ropes. All cattle must be tied in their stalls.

45. Servants in charge of Stock must bring their own buckets or pails, and a piece of rope to carry their forage.

46. Strong loose boxes will be provided for Stallions and three and two-year old Entire Colts, in which they can remain all night, and loose boxes for Mares with foal at foot; closed-in stables for all the other horses, and covered

accommodation for the whole of the other stock. Night accommodation will be provided for Attendants on Stock, and those requiring the same must make application when they return their Entry Schedules, and remit the charge along with their stall rent.

47. Straw, hay, grass, and tares will be provided free by the Society during the four days of the Show; other kinds of food will be supplied at fixed prices in the forage yard. Any Servant removing bedding from an adjoining stall will be fined in double the amount taken. Exhibitors may fetch their own cake or corn to the Yard, but not grass, tares, hay, nor straw. Coops, food, and attendance for Poultry will be found by the Society.

48. Cattle, Sheep, Swine, or Poultry cannot be removed from the Yard till 5 P.M. on Friday, 30th July, except on certificate by the Veterinary Surgeon employed by the Directors.

49. Horses may be withdrawn at 6 o'clock each evening on a deposit of £2 for each animal, which shall be forfeited if the animal is not brought back. They must return at half-past 7 o'clock the following morning, and those not in before 8 will forfeit 10s. Horse passes to be applied for at the Committee Rooms between 5 and 6 P.M. on Tuesday, and the deposit will be returned between 12.30 and 2.30 on Friday.

50. When the Stock is leaving the Yard, no animal is to be moved till ordered by those in charge of clearing the Yard. Those transgressing this Rule will be detained till all the other Stock is removed.

JUDGING STOCK AND POULTRY.

51. On Tuesday, 27th July, Exhibitors, and all others except Servants in charge of Stock, must leave the Yard at 10 A.M.

52. The Judges will commence their inspection at 11 A.M., when the public will be admitted. The space reserved for the Judges will be enclosed by ropes, and no encroachment will be permitted. In no case shall a Premium be awarded unless the Judges deem the animals to have sufficient merit; and where only one or two lots are presented in a section, and the Judges consider them unworthy of the premiums offered, it shall be in their power to award a lower prize, or to suggest the removal of any lot which appears to them unworthy of being placed in the Yard.

53. In addition to the Premiums, the Judges are authorised to award three Commendations in each section (except Poultry, where only two prizes are to be awarded) if the entries are numerous and the animals of sufficient merit. These Commendations to consist of—Very Highly Commended, Highly Commended, and Commended.

54. The animals in Sections 23 and 24 (Ayrshire Breed) which have not calved before the Show will be judged along with Cows in Calf, and those in Section 24 which have calved before the Show will be judged along with Cows in Milk in section 23.

55. Two Members of Committee will attend each Section of the Judges. It will be their duty to see that no obstruction is offered to them, and that the space reserved for them is not encroached on; to communicate to the Secretary any question that may arise for the consideration of the Committee; to complete their reports; and to ticket the prize animals.

56. It shall not be competent for any Exhibitor, nor for his Factor or Land-Steward, to act as a Judge or Attending Member in any class in which he is competing; and no Exhibitor shall remain in charge of any lot, whether belonging to himself or another, while the Judges are at work in the Yard.

WOOL.

57. Wool to be entered with the Secretary on or before 11th June. Received in the Showyard on Monday 26th July, and till 10 A.M. on Tuesday 27th July. Judged at 11 A.M. on Tuesday. Exhibited Tuesday, Wednesday, Thursday, and Friday, 27th, 28th, 29th, and 30th July.

58. All the fleeces must be white and folded with the outside out. They must be shown as *clipped off the* Exhibitor's Sheep, which must be *bona fide* his own property. Blackfaced fleeces must be unwashed.

STALL RENT.

59. The following rates shall be paid by Exhibitors when making their Entries:—

	Members.		Non-Members.	
	s.	*d.*	*s.*	*d.*
Cattle,	15	0	25	0
Loose boxes for Stallions—3 and 2 year old entire Colts,	40	0	50	0
All other Horses,	20	0	30	0
Sheep, per pen,	10	0	15	0
Swine, per pen,	15	0	20	0
Poultry, each entry,	4	0	6	0
Wool, each entry,	4	0	6	0
Night accommodation for Attendants, each,	10	0	12	0
Covered Booths for offices, 9 feet by 9 feet,	70	0	100	0
Newspaper offices, £2, 10s.				

IMPLEMENTS AND MACHINERY.

60. Implements to be entered with the Secretary on or before 4th June. Received in the Yard on Tuesday, 20th July, and till ten o'clock on the morning of Tuesday, 27th July. Exhibited Tuesday, Wednesday, Thursday, and Friday, 27th, 28th, 29th, and 30th July.

61. No Money Prizes or Medals will be given for Implements of any kind, and no inspection of them by Judges will take place.

62. Agricultural Implements, and Implements and collections of articles not Agricultural, will be received for Exhibition, but the Secretary will be entitled to refuse Entries from dealers in articles not deemed worthy of Exhibition.

63. Implements will be placed in the following sections, viz.:—1st, Under cover; 2d, Under cover allowed to be closed in all round; 3d, Part under cover and part open; 4th, Open; 5th, Under cover or open, or part under cover and part open, for articles not in motion belonging to Exhibitors in motion yard; 6th, Motion yard. Exhibitors must intimate in which section their Exhibits are to be placed, and specify the space they require.

64. The articles of each Exhibitor will be all placed in one stand, except implements in motion, and must not on any account extend beyond the width allowed. No article to be moved out of its stand, or the stand dismantled, till the termination of the Show, at 5 P.M. on Friday, 30th July. Those infringing this rule will be reported to the Directors.

65. Exhibitors must arrange their own articles *within* the space allotted to them before 11 o'clock on Tuesday the 27th July, and to the satisfaction of those in charge of the Implement Yard.

66. Exhibitors must on no account leave their stands during the judging of Stock, and if found in the Stock Yard they will be fined 10s.

67. All Machines requiring steam or fire must be entered as such in the Certificate, and will be placed in the Motion Yard. Coke must be used in all cases where fire is required.

68. No Steam Engine shall be driven in the Yard at a greater speed than 6 miles an hour.

69. Locomotive and Traction Engines and other Machines must not be moved from their places without permission of the Secretary, and must not be moved from their stands till 5.30 P.M. on Friday.

70. There must be attached to each Implement, when forwarded to the Show, a label bearing the Exhibitor's name, and that of the implement.

71. The carriage of all Implements must be prepaid.

STALL RENT.

72. No smaller space than 6 feet frontage, 20 feet deep (in Motion Yard 50 feet deep), can be allowed for Implements, and, except in the closed-in stalls, no boarding shall exceed 4 feet in height.

73. Implement Exhibitors who are Members of the Society are entitled to either 20 feet by 20 feet of open space free; or in Motion Yard 8 feet by 50 feet of open space free; for additional space the charge is as follows:—

	Members.	Non-Members.
Implement Shedding, 20 feet deep, per foot . .	£0 3 0	£0 4 0
Implements without Shedding, 20 feet deep, per foot	0 1 0	0 2 0
Implement Shedding in Motion Yard, 20 feet deep with 30 feet open space behind	0 4 6	0 7 0
Implements in Motion Yard, without shedding, 50 feet deep, per foot	0 2 6	0 5 0
Covered Booths for offices, 9 feet by 9 feet . . .	3 10 0	5 0 0
Newspaper offices . . . . . £2, 10s.		

ADMISSION TO YARD.

The public will be admitted on Tuesday, 27th July, at 11 A.M., when the inspection by the Judges commences. The charges will be—Tuesday, from 11 A.M. till 5 P.M., 10s; Wednesday, from 8 A.M. till 5 P.M., 2s. 6d.; Thursday, from 8 A.M. till 1 P.M., 2s. 6d., after 1 o'clock, 1s.; Friday, from 8 A.M. till 12 noon, 1s., and from 12 till 5 P.M. 6d.

Members of the Society are admitted to the Show-Yard without payment, on exhibiting a "*Member's Ticket*," which is strictly not transferable. Tickets will be sent to all Members residing in the Counties connected with the Show. Members residing in other localities must apply for Tickets at the Secretary's Office, 3 George IV. Bridge, Edinburgh, *before the 17th of July*.

Exhibitors of Stock (not Members) will be charged 5s. for admission to the judging on Tuesday; on Wednesday at 8 A.M., and throughout the Show they will be admitted free.

Exhibitors of Implements and their attendants will be entitled to free entry during the Show, but must remain at their stalls during the judging of the Stock on Tuesday.

Tickets for attendants on Stock and Implements are not available to admit to the Yard between 9 A.M. and 5 P.M.; and any attendant requiring to leave the Yard during the day, cannot be again admitted except by a special pass (to be applied for at the Committee Room), which must be given up on his return.

Placards are prohibited both inside the Show-Yard and on the outside of the Boundary Fence, with the exception of those belonging to Exhibitors, whose right is confined to their own stalls. No newspapers or any other article allowed to be carried about the Yard for sale. No strolling bands admitted.

No Carriages or Equestrians admitted without special leave from the Directors, and then only for Invalids. Bath chairs may be brought in.

Premium Lists, Regulations, and Certificates of Entry, may be obtained by applying at the Secretary's Office, No. 3 George IV. Bridge, Edinburgh.

All Communications should be addressed to FLETCHER NORTON MENZIES, Esq., *Secretary of the Highland and Agricultural Society of Scotland, No. 3 George IV. Bridge, Edinburgh.*

LAST DAYS OF ENTRY.

IMPLEMENTS—FRIDAY, 4TH JUNE.

STOCK AND ALL OTHER ENTRIES—FRIDAY, 11TH JUNE.

RAILWAY ARRANGEMENTS.

The Caledonian, North British, and Glasgow and South-Western Railway Companies have adopted the following regulations :—

1. Stock and Implements to the Show to be charged full rates.
2. From the Show, if sold, full rates.
3. From the Show, if unsold, to be conveyed back at one-half the ordinary charge to the station whence they were sent, on production of a certificate from the Secretary of the Show, to the effect that they are really unsold. *This Regulation applies only if the Traffic is conveyed by Goods Trains, there being no reduction in the rates when it is conveyed by Passenger Trains.*
4. Horses—
   (*a*) A Stallion to be charged the rate for one Horse, plus 50 per cent.
   (*b*) Any other Horse, for which the exclusive use of a horse-box is required, to be charged the rate for one Horse, plus 50 per cent.
   (*c*) Other Horses to be charged at ordinary rates.
5. Bulls, Cows, and other Animals—
   (*a*) A Bull, Cow, or other animal sent in a horse-box, and requiring the exclusive use of the box, to be charged the rate for three Horses.
   (*b*) Bulls, Cows, or other animals sent in horse-boxes, but not requiring the exclusive use of the box, to be charged each the rate for one Horse, plus 50 per cent.
6. Poultry.—The Companies give notice that they are not common carriers of poultry; they will, however, to accommodate the public, carry such by special agreement only, and at special rates, to be obtained at the Companies' stations.
7. Dogs to be charged full rates both ways.
8. All the above to be carried at owners' risk.
9. Collection and Delivery to be performed in all cases by the owners.

The Highland and Great North of Scotland Railway Companies have adopted the following Clearing-House Regulations.—

1. Stock and implements to the Show to be charged full rates.
2. From the Show, if sold, full rates.
3. From the Show, if unsold, to be conveyed at *half rates* back, to the station whence they were sent, on production of a certificate from the Secretary of the Agricultural Show to the effect that they are really unsold.
4. All the above to be carried at owners' risk.
5. When agricultural machines and implements are carried under these regulations to and from Shows, they must be invoiced station to station at the ordinary rates. Collection and delivery at sending station, and delivery to, or collection from, the Show-Yard to be performed by, or at the expense of the owners.
6. Regulations Nos. 1, 2, and 3, as to Cattle and Horses, to apply only if the traffic be conveyed in Cattle Waggons and by Goods Trains.
7. Poultry and Dogs to be charged full rates both ways.
8. No reduction in the ordinary rates for Horses or Cattle when conveyed in Horse-boxes.
9. Parties requiring the exclusive use of a Horse-box for only one animal to be charged one fare and a half.

The North-Eastern Railway Company has adopted the above Clearing-House Regulations, except No. 9, which they have altered as follows :—"If three stalls be occupied, or if the exclusive use of a box be ordered, 25 per cent. beyond the ordinary charge for three horses."

PREMIUMS.

THE TWEEDDALE GOLD MEDAL, *value £20, will be given for the best Border Leicester Tup in the Yard. All former Prize Animals are eligible to compete.*

TWO SILVER CUPS, *value £25 each, will be given for the best Stallion and for the best Mare for Agricultural purposes. All former Prize Animals, as well as all former Winners of the Cups, are eligible to compete.*

In addition to the Premiums, the Judges are authorised to award three Commendations in each section (except Poultry, where only two prizes are to be awarded) if the entries are numerous, and the animals of sufficient merit. These Commendations to consist of —Very Highly Commended, Highly Commended, and Commended.

CLASS I.—CATTLE.

SECTION	SHORT HORN.	
1.	Best Bull calved before 1st Jan. 1878,	£25
	Second best,	15
	Third best,	10
	Breeder of best Bull, The Silver Medal.	
2.	Best Bull calved after 1st Jan. 1878,	25
	Second best,	15
	Third best,	10
3.	Best Bull calved after 1st Jan. 1879,	15
	Second best,	10
	Third best,	5
4.	Best Cow of any age,	20
	Second best,	10
	Third best,	5
5.	Best Heifer calved after 1st Jan. 1878,	15
	Second best,	10
	Third best,	5
6.	Best Heifer calved after 1st Jan. 1879,	10
	Second best,	8
	Third best,	4
7.	Best Cow of any age and two of her descendants, male or female,	20
	Second best,	10
	Third best,	5
	Carry forward,	£252

Section			Brought forward,	£252

POLLED ANGUS OR ABERDEEN.

8.	Best Bull calved before 1st Jan. 1878,	£20	
	Second best,	10	
	Third best,	5	
	Breeder of best Bull, The Silver Medal.		
9.	Best Bull calved after 1st Jan. 1878,	20	
	Second best,	10	
	Third best,	5	
10.	Best Bull calved after 1st Jan. 1879,	10	
	Second best,	5	
	Third best,	3	
11.	Best Cow of any age,	20	
	Second best,	10	
	Third best,	5	
12.	Best Heifer calved after 1st Jan. 1878,	10	
	Second best,	6	
	Third best,	4	
13.	Best Heifer calved after 1st Jan. 1879,	8	
	Second best,	5	
	Third best,	3	
			159

GALLOWAY.

14.	Best Bull calved before 1st Jan. 1878,	£20	
	Second best,	10	
	Third best,	5	
	Breeder of best Bull, The Silver Medal.		
15.	Best Bull calved after 1st January 1878,	20	
	Second best,	10	
	Third best,	5	
16.	Best Bull calved after 1st Jan. 1879,	10	
	Second best,	5	
	Third best,	3	
17.	Best Cow of any age,	20	
	Second best,	10	
	Third best,	5	
18.	Best Heifer calved after 1st Jan. 1878,	10	
	Second best,	6	
	Third best,	4	
19.	Best Heifer calved after 1st Jan. 1879,	8	
	Second best,	5	
	Third best.	3	
			159
	Carry forward,		£570

Section			
	Brought forward,		£570
	AYRSHIRE.		
20.	Best Bull calved before 1st Jan. 1878,	£20	
	Second best,	10	
	Third best,	5	
	Breeder of best Bull,	The Silver Medal.	
21.	Best Bull calved after 1st Jan. 1878,	20	
	Second best,	10	
	Third best,	5	
22.	Best Bull calved after 1st Jan. 1879,	10	
	Second best	5	
	Third best	3	
23.	Best Cow in Milk, of any age,	20	
	Second best,	10	
	Third best,	5	
24.	Best Cow in Calf, of any age, or Heifer in Calf, calved before 1st Jan. 1878,	15	
	Second best,	10	
	Third best,	5	
25.	Best Heifer calved after 1st Jan. 1878,	10	
	Second best,	6	
	Third best,	4	
26.	Best Heifer calved after 1st Jan. 1879,	8	
	Second best,	5	
	Third best,	3	
			189
	HIGHLAND.		
27.	Best Bull calved before 1st Jan. 1878,	£20	
	Second best,	10	
	Third best,	5	
	Breeder of best Bull,	The Silver Medal.	
28.	Best Bull calved after 1st Jan. 1878,	20	
	Second best,	10	
	Third best,	5	
29.	Best Cow of any age,	20	
	Second best,	10	
	Third best,	5	
30.	Best Heifer calved after 1st Jan. 1877,	10	
	Second best,	6	
	Third best,	4	
31.	Best Heifer calved after 1st Jan. 1878,	8	
	Second best,	5	
	Third best,	3	
			141
	Carry forward,		£900

Section			
	Brought forward,		£900
	FAT STOCK.		
32.	Best Highland Ox calved after 1st Jan. 1876,	£6	
	Second best,	3	
33.	Best Highland Ox calved after 1st Jan. 1877,	5	
	Second best,	2	
34.	Best Polled Ox calved after 1st Jan. 1877,	6	
	Second best,	3	
35.	Best Polled Ox calved after 1st Jan. 1878,	5	
	Second best,	2	
36.	Best Ox, of any other Pure or Cross Breed, calved after 1st Jan. 1877,	6	
	Second best,	3	
37.	Best Ditto, calved after 1st Jan. 1878,	5	
	Second best,	2	
38.	Best Cross-bred Heifer, calved after 1st Jan. 1877,	6	
	Second best,	3	
39.	Best Cross-bred Heifer, calved after 1st Jan. 1878,	5	
	Second best,	2	
			64
			£964

CLASS II.—HORSES.

FOR AGRICULTURAL PURPOSES.*

1.	Best Stallion foaled before 1st Jan. 1877,	£40
	Second best,	30
	Third best,	20
	Fourth best,	10
	Breeder of best Stallion, The Silver Medal.	
2.	Best Entire Colt foaled after 1st Jan. 1877,	30
	Second best,	20
	Third best,	10
	Fourth best,	5
3.	Best Entire Colt foaled after 1st Jan. 1878,	20
	Second best,	14
	Third best,	7
	Fourth best,	4
4.	Best Entire Colt foaled after 1st Jan. 1879,	15
	Second best,	8
	Third best,	4
	Fourth best,	2
5.	Best Mare (with Foal at foot) foaled before 1st Jan. 1877,	30
	Second best,	20
	Third best,	15
	Fourth best,	6
	Carry forward,	£310

* Two Silver Cups, value £25 each, will be given for the best Stallion and for the best Mare for Agricultural purposes. All former Prize Animals, as well as all former Winners of the Cups, are eligible to compete.

HORSES—*continued.*

Section			
	Brought forward,		£310
6.	Best Mare (in Foal) foaled before 1st Jan. 1877,		25
	Second best,		15
	Third best,		10
	Fourth best,		5
7.	Best Filly foaled after 1st Jan. 1877,		20
	Second best,		10
	Third best,		5
	Fourth best,		3
8.	Best Filly foaled after 1st Jan. 1878,		15
	Second best,		8
	Third best,		4
	Fourth best,		2
9.	Best Filly foaled after 1st Jan. 1879,		10
	Second best,		5
	Third best,		3
	Fourth best,		2
10.	Best Draught Gelding foaled before 1st Jan. 1877,		10
	Second best,		5
	Third best,		3
11.	Best Draught Gelding, foaled after 1st Jan. 1877,		8
	Second best,		4
	Third best,		2
			£484

HUNTERS AND ROADSTERS.

12.	Best Brood Mare, with Foal at foot, suitable for Field,	£20	
	Second best,	10	
	Third best,	5	
13.	Best Mare or Gelding, suitable for Field, foaled before 1st Jan. 1876,	30	
	Second best,	15	
	Third best,	10	
14.	Best Mare or Gelding, suitable for Field, foaled after 1st Jan. 1876,	30	
	Second best,	15	
	Third best,	10	
15.	Best Mare or Gelding, suitable as Hackney or Roadster, between 14 and 15 hands high,	8	
	Second best,	4	
	Third best,	2	
16.	Best Stallion, Mare, or Gelding, for leaping,	20	
	Second best,	10	
	Third best,	6	
			195
	Carry forward,		£679

Section			Brought forward,	£679
	PONIES.			
17.	Best Highland Stallion, 14½ hands and under,		£6	
	Second best,		3	
	Third best,		1	
18.	Best Highland Mare or Gelding, between 13 and 14½ hands high,		6	
	Second best,		3	
	Third best,		1	
19.	Best Mare or Gelding, between 12½ and 14 hands high,		6	
	Second best,		3	
	Third best,		1	
20.	Best Mare or Gelding, under 12½ hands high,		6	
	Second best,		3	
	Third best,		1	
				40
	STALLIONS FOR AGRICULTURAL PURPOSES.			
	Best Stallion for Agricultural purposes to serve in the District of the Show in season 1880, Competition to take place in spring,			150
				£869

CLASS III.—SHEEP.

	CHEVIOT.		
1.	Best Tup, three shear and upwards,		£8
	Second best,		4
	Third best,		2
2.	Best Tup, two shear,		12
	Second best,		8
	Third best,		4
3.	Best Shearling Tup,		12
	Second best,		8
	Third best,		4
4.	Best 5 Ewes above one shear,		10
	Second best,		5
	Third best,		2
	Best Pen of Lambs shown with Ewes,		2
	Second best,		1
5.	Best 5 Shearling Ewes or Gimmers,		10
	Second best,		5
	Third best,		2
			£99
	BLACKFACED.		
6.	Best Tup, three shear and upwards	£8	
	Second best,	4	
	Third best,	2	
	Carry forward,	£14	£99

Section			
	Brought forward,	£14	£99
	BLACKFACED—*continued.*		
7.	Best Tup, two shear,	12	
	Second best,	8	
	Third best,	4	
8.	Best Shearling Tup,	12	
	Second best,	8	
	Third best,	4	
9.	Best 5 Ewes above one shear,	10	
	Second best,	5	
	Third best,	2	
	Best Pen of Lambs shown with Ewes,	2	
	Second best,	1	
10.	Best 5 Shearling Ewes or Gimmers,	10	
	Second best,	5	
	Third best,	2	
			99
	BORDER LEICESTER.*		
11.	Best Tup, three shear and upwards,	£8	
	Second best,	4	
	Third best,	2	
12.	Best Tup, two shear,	12	
	Second best,	8	
	Third best,	4	
13.	Best Shearling Tup,	12	
	Second best,	8	
	Third best,	4	
14.	Best 5 Ewes above one shear,	10	
	Second best,	5	
	Third best,	2	
15.	Best 5 Shearling Ewes or Gimmers,	10	
	Second best,	5	
	Third best,	2	
16.	Best aged Tup, 2 Ewes, 2 Gimmers, 2 Ewe Lambs, and 2 Shearling Tups. The Ewes to have Lambs in Season 1880, and all bred by Exhibitor except aged Tup,	15	
	Second best,	10	
	Third best,	5	
			126
	LEICESTER.		
17.	Best Tup above one shear,	3	
	Second best,	2	
	Third best,	1	
18.	Best Shearling Tup,	3	
	Second best,	2	
	Third best,	1	
19.	Best 5 Ewes above one shear,	3	
	Second best,	2	
	Third best,	1	
	Carry forward,	£18	£324

* The Tweeddale Gold Medal, value £20, will be given for the best Border Leicester Tup in the Yard. All former Prize Animals are eligible to compete.

LEICESTER—*continued.*

SECTION			Brought forward, £18	£324
20.	Best 5 Shearling Ewes or Gimmers,		3	
	Second best,		2	
	Third best,		1	
			——	24

COTSWOLD AND LINCOLN.

21.	Best Tup above one shear,		£3	
	Second best,		2	
	Third best,		1	
22.	Best Shearling Tup,		3	
	Second best,		2	
	Third best,		1	
23.	Best 5 Ewes above one shear,		3	
	Second best,		2	
	Third best,		1	
24.	Best 5 Shearling Ewes or Gimmers,		3	
	Second best,		2	
	Third best,		1	
			——	24

SHORT WOOLLED.

25.	Best Tup above one shear,		3	
	Second best,		2	
	Third best,		1	
26.	Best Shearling Tup,		3	
	Second best,		2	
	Third best,		1	
27.	Best 5 Ewes above one shear,		3	
	Second best,		2	
	Third best,		1	
28.	Best 5 Shearling Ewes or Gimmers,		3	
	Second best,		2	
	Third best,		1	
			——	24

EXTRA SECTIONS.

29.	Best 5 Cheviot Wethers, not above 3 shear,		4	
	Second best,		2	
30.	Best 5 Blackfaced Wethers, not above 4 shear,		4	
	Second best,		2	
31.	Best 5 half-bred* Wether Hoggs, not above 1 shear,		4	
	Second best,		2	
32.	Best 5 Cross-bred† Wether Hoggs, not above 1 shear,		4	
	Second best,		2	
			——	24
				£420

* Half-breds must be the progeny of any kind of Long-Woolled or Short-Woolled Tup (except Blackfaced) with Cheviot Ewes.

† Cross-breds must be the offspring of any Whitefaced or Short-Woolled Tup with Blackfaced Ewes, or the progeny of Blackfaced Tups with Whitefaced or Short-Woolled Ewes.

CLASS IV.—SWINE.

LARGE BREED.

1.	Best Boar,		£8
	Second best,		4
	Third best,		2
2.	Best Sow,		6
	Second best,		3
	Third best,		1
3.	Best Pen of 3 Pigs, not above 8 months old,		4
	Second best,		2
	Third best,		1
			£31

BLACK OR BERKSHIRE.

4.	Best Boar,	£8	
	Second best,	4	
	Third best,	2	
5.	Best Sow,	6	
	Second best,	3	
	Third best,	1	
6.	Best Pen of 3 Pigs, not above 8 months old,	4	
	Second best,	2	
	Third best,	1	
			31

SMALL BREED.

7.	Best Boar,	8	
	Second best,	4	
	Third best,	2	
8.	Best Sow,	6	
	Second best,	3	
	Third best,	1	
9.	Best Pen of 3 Pigs, not above 8 months old,	4	
	Second best,	2	
	Third best,	1	
			31
			£93

EXTRA STOCK.

Animals not included in the Sections for Competition may be exhibited as Extra Stock, and will receive Honorary Premiums when specially commended, as follows :—

CATTLE AND HORSES.

Very highly commended,	Medium Gold Medal.
Highly commended,	Minor Gold Medal.
Commended,	Silver Medal.

SHEEP AND SWINE.

Very highly commended,	Minor Gold Medal.
Highly commended,	Silver Medal.
Commended,	Medium Silver Medal.

CLASS V.—POULTRY.

First Premium—One Sovereign; Second Premium—Ten Shillings—in all the Sections of Poultry.

Aged Birds must have been hatched previous to, and Cockerels and Pullets in, 1880.

	Section	*Section*
Dorking—*Silver Grey*, .	1. Cock. 3. Cockerel.	2. 2 Hens. 4. 2 Pullets.
Dorking—*Coloured*, .	5. Cock. 7. Cockerel.	6. 2 Hens. 8. 2 Pullets.
Cochin-China, .	9. Cock. 11. Cockerel.	10. 2 Hens. 12. 2 Pullets.
Brahmapootra, . .	13. Cock. 15. Cockerel.	14. 2 Hens. 16. 2 Pullets.
Spanish, . . .	17. Cock. 19. Cockerel.	18. 2 Hens. 20. 2 Pullets.
Scotch Grey, . .	21. Cock. 23. Cockerel.	22. 2 Hens. 24. 2 Pullets.
Hamburg—*Pencilled* .	25. Cock. 27. Cockerel.	26. 2 Hens. 28. 2 Pullets.
Hamburg—*Spangled*, .	29. Cock. 31. Cockerel.	30. 2 Hens. 32. 2 Pullets.
Any other Pure Breed,	33. Cock. 35. Cockerel.	34. 2 Hens. 36. 2 Pullets.
Game—*Black or Brown Reds*, . . .	37. Cock. 39. Cockerel.	38. 1 Hen. 40. 1 Pullet.
Game—*Any other Pure Breed*, .	41. Cock. 43. Cockerel.	42. 1 Hen. 44. 1 Pullet.
Bantams—*Game*, . .	45. Cock. 47. Cockerel.	46. 1 Hen. 48. 1 Pullet.
Bantams—*Sebright*, .	49. Cock. 51. Cockerel.	50. 2 Hens. 52. 2 Pullets.
Bantams—*Any other Pure Breed*, . .	53. Cock. 55. Cockerel.	54. 2 Hens. 56. 2 Pullets.
Ducks—*White Aylesbury*,	57. Drake. 59. Drake (Young).	58. 1 Duck. 60. 1 Duckling.
Ducks—*Rouen*, . .	61. Drake. 63. Drake (Young).	62. 1 Duck. 64. 1 Duckling.

POULTRY—*continued.*

	Section.	*Section.*
DUCKS—*Any other Pure Breed,*	65. Drake.	66. 1 Duck.
	67. Drake (Young).	68. 1 Duckling.
TURKEYS—*Any Pure Breed,*	69. Cock.	70. 1 Hen.
	71. Cock (Poult).	72. 1 Hen (Poult).
GEESE—*Any Pure Breed,*	73. Gander.	74. 1 Goose.
	75. Gander (Young).	76. 1 Gosling.

Amount of Poultry Premiums, £114.

CLASS VI.—WOOL.

SECTION

1. Best 5 fleeces of Cheviot White Wool,	£3
Second best,	2
2. Best 5 fleeces of Blackfaced White Wool,	3
Second best,	2
3. Best 5 fleeces of Leicester Wool,	3
Second best,	2
	£15

CLASS VII.—IMPLEMENTS, &c.

Reference is made to the General Regulations for the terms on which Implements and Machines may be exhibited.

CLASS VIII.—BEE HUSBANDRY.

£20 and 2 Silver Medals have been granted to the Caledonian Apiarian and Entomological Society. Information to be obtained from and Entries made with Mr R. J. Bennett, 50 Gordon Street, Glasgow.

ABSTRACT OF PREMIUMS.

1. Cattle,	£964	0	0
2. Horses,	869	0	0
3. Sheep,	420	0	0
4. Swine,	93	0	0
5. Poultry,	114	0	0
6. Wool,	15	0	0
7. Tweeddale Gold Medal,	20	0	0
8. Two Silver Cups,	50	0	0
9. Six Silver Medals to Breeders of best Aged Bulls and best Stallion,	4	16	0
10. Extra Stock, say	100	0	0
11. Bee Husbandry,	21	12	0
	£2671	8	0

F. N. MENZIES, *Secretary.*

George IV. Bridge, Edinburgh,
21*st January* 1880.

HIGHLAND AND AGRICULTURAL SOCIETY.

GENERAL SHOW OF STOCK AND IMPLEMENTS

At STIRLING, 1881.

The District connected with the Show comprises the Counties of Stirling, Dumbarton, and Clackmannan, and the Western Division of Perthshire.

Premiums will be offered for the following Classes :—

CATTLE.

SHORTHORN.

Bulls calved before 1st December 1878
Bulls calved on or after 1st December 1878
Bulls calved on or after 1st December 1879
Cows of any age.
Heifers calved on or after 1st December 1878
Heifers calved on or after 1st December 1879

POLLED ANGUS OR ABERDEEN.

Bulls calved before 1st December 1878
Bulls calved on or after 1st December 1878
Bulls calved on or after 1st December 1879
Cows of any age.
Heifers calved on or after 1st December 1878
Heifers calved on or after 1st December 1879

GALLOWAY.

Bulls calved before 1st December 1878
Bulls calved on or after 1st December 1878
Bulls calved on or after 1st December.....1879
Cows of any age.
Heifers calved on or after 1st December 1878
Heifers calved on or after 1st December 1879

AYRSHIRE.

Bulls calved before 1st December 1878
Bulls calved on or after 1st December..... 1878
Bulls calved on or after 1st December.....1879
Cows in milk calved before 1st December 1877
Cows in milk calved on or after 1st December 1877
Cows in calf of any age, or Heifers in calf calved before 1st Dec....1878
Heifers calved on or after 1st December 1878
Heifers calved on or after 1st December 1879

Family Prize.—The Family to consist of a Cow of any age, and three or more of her descendants, Male or Female.

HIGHLAND.

Bulls calved before 1st December 1877
Bulls calved on or after 1st December 1877
Bulls calved on or after 1st December 1878
Cows of any age.
Heifers calved on or after 1st December 1877
Heifers calved on or after 1st December 1878

FAT STOCK.

Highland Oxen calved before 1st December 1877
Highland Oxen calved on or after 1st December 1877
Polled Oxen calved before 1st December 1878
Polled Oxen calved on or after 1st December 1878
Oxen of any other pure or cross breed calved before 1st December 1878
Oxen of any other pure or cross breed calved on or after 1st Dec. 1878
Cross-bred Heifers calved before 1st December 1878
Cross-bred Heifers calved on or after 1st December 1878

HORSES

For Agricultural Purposes.

Stallions foaled before 1st January.....1878
Entire Colts foaled after 1st January 1878
Entire Colts foaled after 1st January 1879
Entire Colts foaled after 1st January 1880
Mares with foals at foot, foaled before 1st January.....1878
Mares in foal, foaled before 1st January 1878
Fillies foaled after 1st January.....1878
Fillies foaled after 1st January.....1879
Fillies foaled after 1st January.....1880
Draught Geldings foaled before 1st January 1878
Draught Geldings foaled after 1st January 1878

Stallion to serve in the District of the Show in Season 1881.

HUNTERS AND ROADSTERS.

Brood Mares, with foals at foot, suitable for field.
Mares or Geldings, suitable for field, foaled before 1st January 1877
Mares or Geldings, suitable for field, foaled after 1st January.....1877
Mares or Geldings, suitable as Hackneys or Roadsters, between 14 and 15 hands high.
Stallions, Mares, or Geldings, for leaping.

PONIES.

Highland Stallions 14½ hands and under.
Highland Mares or Geldings between 13 and 14½ hands high.
Mares or Geldings between 12½ and 14 hands high.
Mares or Geldings under 12½ hands.

SHEEP.

Ewes and Gimmers to be exhibited in pens of three; Wethers and Hoggs in pens of five.

BLACKFACED.

Tups above one shear.
Shearling Tups.
Ewes above one shear.
Shearling Ewes or Gimmers.

Family Prize.—The Family to consist of one aged Tup, two Ewes, two Shearlings, and two Lambs. The Ewes to have Lambs in Season 1881, *and all bred by Exhibitor except aged Tup.*

CHEVIOT.

Tups above one shear.
Shearling Tups.
Ewes above one shear.
Shearling Ewes or Gimmers.

BORDER LEICESTER.

Tups above one shear.
Shearling Tups.
Ewes above one shear.
Shearling Ewes or Gimmers.

LEICESTER.

Tups above one shear.
Shearling Tups.
Ewes above one shear.
Shearling Ewes or Gimmers.

COTSWOLD AND LINCOLN.

Tups above one shear.
Shearling Tups.
Ewes above one shear.
Shearling Ewes or Gimmers.

SHORT-WOOLLED.

Tups above one shear.
Shearling Tups.
Ewes above one shear.
Shearling Ewes or Gimmers.

EXTRA SECTIONS.

Cheviot Wethers not above three shear.
Blackfaced Wethers not above four shear.
* Half-bred Wethers one shear.
† Cross-bred Wethers one shear.

Sheep not included in the above Classes must be entered as Extra Stock.

* Half-breds must be the progeny of any kind of Long-woolled or Short-woolled Tup (except Blackfaced) with Cheviot Ewes.

† Cross-breds must be the offspring of any Whitefaced or Short-woolled Tup with Blackfaced Ewes, or the progeny of Blackfaced Tups with Whitefaced or Short-woolled Ewes.

WOOL.

Best Woolled Tups of the Blackfaced, Cheviot, and Leicester Breeds.

SWINE.

Pigs to be exhibited in pens of three.

LARGE BREED.

Boars.
Sows.
Pigs not above 8 months old.

BLACK OR BERKSHIRE.

Boars.
Sows.
Pigs not above 8 months old.

SMALL BREED.

Boars.
Sows.
Pigs not above 8 months old.

COLLIE DOGS.

1. Dogs—Long haired, not exceeding 6 years old.
2. Bitches—Long haired, not exceeding 6 years old.
3. Dogs—Short haired, not exceeding 6 years old.
4. Bitches—Short haired, not exceeding 6 years old.

POULTRY.

To be shown in Pens of One Cock or Cockerel and Two Hens or Pullets of each of the following breeds, except in the sections for Ducks, Turkeys, Geese, and Hens and Pullets of the Game and Malay Breeds, where only one bird is required:—

Dorking—Silver-Grey.
Dorking—Coloured.
Cochin-China.
Brahmapootra.
Spanish.
Scotch Grey.
Hamburg—Pencilled.
Hamburg—Spangled.
Any other pure Breed.
Game—Black or Brown Reds.
Game—Any other pure variety.
Bantams—Game.
Bantams—Sebright.
Bantams—Any other pure variety.
Ducks—White Aylesbury.
Ducks—Rouen.
Ducks—Any other pure Breed.
Turkeys—Any pure Breed.
Geese—Any pure Breed.

F. N. MENZIES, *Secretary.*

3 GEORGE IV. BRIDGE, EDINBURGH.
21*st January* 1880.

MEMBERS

ADMITTED SINCE THE LIST WAS PUBLISHED IN MARCH 1879.

18TH JUNE 1879.

Anderson, Archibald Turnbull, Perth.
Anderson, James, Innkeeper, Ben Lawers, Killin.
Anderson, John, Royal Hotel, Blairgowrie.

Balfour, Dr Isaac Bayley, Professor of Botany, University, Glasgow.
Beattie, James, Factor, Gray Estates, Rockdale Cottage, Perth.
Bell, Alex., Kirkton of Tealing, Dundee.
Bell, James, M.D., Kingskettle, Fifeshire.
Bell, William, Balmuth, Dundee.
Black, George, Implement Agent, Victoria Street, Perth.
Blyth, James, Leckiebank, Auchtermuchty.
Bonnor, G. H., Factor's Office, St Martin's, Perth.
Bonthron, Alex., Newton of Falkland, Falkland, Fife.
Bowman, James, Square, Huntly.
Brown, James W., Letham, Inverkeithing.
Bruce, Andrew, Jordanston, Meigle.
Bulloch, George, of Kinloch, Dunkeld.

Campbell, Duncan, Stronuich, Glenlyon, Aberfeldy.
Chalmers, John, Westwood, Stanley, Perth.
Christie, Francis Walter, Sunnyside, Prestonkirk.
Clark, Thomas K., Carriage Builder, Crieff.
Clarkson, Alex., Prettsmill, Thankerton.
Colquhoun, Dugald, Manager, Vitriol Works, Carnoustie.
Crabb, William, The Border Counties Chemical Works, Silloth, Cumberland.
Craig, Alex., Over Milton, East Kilbride.
Cumming, David, Knockeston, Crieff.
Cunningham, David, Burntisland.
Cunningham, John, Burntisland.

Dalgleish, Wm Ogilvie, of Mayfield, Dundee.
Dow, John, Turrich, Amulree, Dunkeld.
Duckering, C. E., Whitehoe, Kirton Lindsey.
Duckering, W., Northorpe, Kirton Lindsey.
Duncan, John, of Dullatur, Newbigging, Carnock, Dunfermline.
Duncan, Patrick Geekie, Easter Memus, Kirriemuir.
Durno, James, Jackston, Rothie Norman.

Ferguson, James, Balunie, Coupar-Angus.
Findlater, James Smith, Balvenie, Dufftown.
Fraser, John M. (Macdonald & Fraser), Cattle Salesman, Perth.
Fullarton, James, Ryehill, Coupar-Angus.
Fyshe, Jas, jun., Easter Balbeggie, Kirkcaldy.

Galloway, Peter, M.R.C.V.S., Loan of Errol, Errol.
Graham, Daniel Morgan, Auctioneer, Forfar.
Grant, John Sinclair, Craigbea, Ballinluig.
Grant, John, Mains of Advie, Advie, Strathspey.
Gray, E. A. Stuart, of Gray and Kinfauns, 19 Manor Place, Edinburgh.
Grieve, James, Langlees, Torryburn.

Holmes, William, Carriage Builder, Fullarton Street, Irvine.
Howie, William, Finnochbog, Inverkip.

Inglis, George, of Newmore, Invergordon.
Ireland, David S., Brewer, St Andrews.

Keay, Robert, Assistant Town-Clerk, Perth.
Kerr, John, Rossie Ochil, Bridge of Earn.
Kinnaird, The Hon. The Master of, Rossie Priory, Inchture.
Knight, Robert, jun., V.S., Woodhead Street, Dunfermline.
Kyd, George (Hay & Kyd), Perth.

Landale, Andrew (Oriental Club, London), Woodmill, Auchtermuchty.

Lawson, Thomas, Sandyford, Kirriemuir.
Leslie, Thomas W., Welton, Blairgowrie.
Letham, John, East Mains, Stonehouse.
Loder, Robert, Whittlebury, Towcester.
Lyell, David, S.S.C., 39 Castle Street, Edinburgh.

M'Callum, James, Fendoch, Crieff.
M'Coll, Duncan, Clachan, Lismore, Oban.
MacDonald, John, Belmore, Gareloch, Helensburgh.
M'Farlane, James, Kinloch, Amulree, Dunkeld.
M'Gillivray, Allan, Gordon Hall, Kingussie.
M'Gregor, Alexander (Harrison, M'Gregor, & Co.), Leigh, Lancashire.
M'Isaac, John, Brae of Monzie, Crieff.
Mackay, George Grant, of Glengloy, Kingussie.
M'Kenzie, Neil, Northfield, West Plean, Stirling.
Mackill, John (Laidlaw & Co.), 29 Waterloo Street, Glasgow.
M'Laren, Charles, Land Steward, Cally Lodge, Dunkeld.
M'Laren, William, Pittendreich, Meikleour.
Macqueen, James, Salutation Coach Office, Princes Street, Perth.
M'Queen, John, Oakwood, Selkirk.
M'Ritchie, David, C.A., 7 North St Andrew Street, Edinburgh.
Main, Robert Ramsay (A. & J. Main & Co.), Possil Park, Glasgow.
Martin, James, Priestfield, Pitlessie, Cupar-Fife.
Menzies, James, Coshieville, Aberfeldy.
Menzies, Robert, Tegarmuchd, Aberfeldy.
Miller, John, Lochland, Crieff.
Mitchell, James, Merchant, Montrose.
Morton, R. G., Engineer, Errol.
Muckersie, Henry, Drumfin, Dunfermline.
Murdoch, Mrs, East Haughhead, Earlston.
Murray, Alex., Factor for Lord Dunmaii, Alderston, Haddington.
Murray, David, jun., Overseer, Dunira, Crieff.
Murray, James, Faichfolds, King-Edward, Banff.

Nairn, Thomas Graham, Dunsinnane, Perth.
North, G. F., Cheswardine, Market Drayton, Salop.

Peterkin, William, Dunglass, Dingwall.
Philip, David, W.S., 41 Charlotte Square, Edinburgh.

Rait, James, Culcrieff, Crieff.
Robertson, Alexander, Ballechin, Ballinluig.
Robertson, Donald, Blackhill, Ballinluig.
Robertson, William, Engineer, Princes Street, Perth.

Scott, John, Land Steward, Blackhill, Ballinluig.
Sim, Peter, Mains of Powfoulis, Falkirk.
Sime, Alexander, Dunbarnie, Largo.
Smith, James, Senior Magistrate, Kelso.
Speir, R. T. N., Culdees Castle, Muthill.
Stirling, Patrick, yr. of Kippendavie, Dunblane.
Stuart, Dugald, of Lochcarron, Ross-shire.

Thiem, Albert M., Windsor Hotel, Princes Street, Edinburgh.
Thomson, James, Coach Works, Stirling.
TWEEDDALE, The Most Noble the Marquis of, Yester, Haddington.

Watt, James, Pitdinnie, Cairneyhill, Dunfermline.
Wilkie, David, Castle Campbell Hotel, Dollar.

Young, John, Cobblebrae, Falkirk.

21st JANUARY 1880.

Aalvik, E. A., Stensö Hardanger, Norway.
Austin, William, Bank Agent, Thornhill.

Bell, John, Stenton, St Monance.
Black, George, Mill of Craibstone, Newhills, Aberdeen.
Bruce, Major-General Robert, of Glendouglie, Milnathort.
Bryden, John, New Mains, Scone.

Campbell, Rev. Archibald, Assapol, Bunessan, Mull.
Carnegie, James, Aytoun Hill, Newburgh, Fife.
Craig, James, Robroyston, Bishopbriggs.
Cuninghame, J. C., of Craigends, Johnstone, Renfrewshire.
Cuninghame, Sir William James M., of Corsehill and Kirktonholme, Bart., M.P., Glenmore House, Maybole.
Curr, James, 32 Charlotte Square, Edinburgh.

Davidson, George, Banchory, Kinghorn.

Elliot, James, Burnhead, Hawick.
Ellis, O. W. (Robey & Co., Lincoln), Bread Street, Edinburgh.

Findlay, Robert Elmsall, of Boturich, Dumbarton.
Forbes, Thomas, Road Surveyor, Mid-Calder.

Gray, George, of Bowerswell, Perth.
Greig, Thomas Crabb, Factor, Rephad, Stranraer.

Haddon, Walter, Factor for Mrs Palmer Douglas of Cavers, Hawick.
Haddow, P. M., Corston, Coupar-Angus.
Hamilton, John Alexander, Goldsmith, 41 George Street, Edinburgh.
Hoggan, Andrew, jun., Camphill, Glasgow.

Imrie, James S., Somerset Villa, Perth.

Jamieson, Alexander, 31 Barossa Place, Perth.
Jamieson, John, 31 Barossa Place, Perth.

Kirkwood, Alexander, Die-Sinker, 9 St James' Square, Edinburgh.

[illegible], A. H., Seedsman, Stranraer.
Macfarlane, David, Needburn, Methven.
Mackenzie, Allan T., yr. of Kintail, Leys Castle, Inverness.
M'Leish, William, Town-Clerk, Perth.
Marshall, John, Sandyford, Holytown.
Marshall, Rev. Theodore, Caputh Manse, Dunkeld.
Morris, Sir John, Wolverhampton.
Morton, David (Graham & Morton), Stirling.
Moult, John, 41 Mosley Street, Newcastle-on-Tyne.
Murdoch, Peter, Househill, Larbert.
Murray, Anthony George, C.E., 141 George Street, Edinburgh.
Murray, Lieut.-Colonel Charles Stewart, Stirling.

Ogilvie, David, West Kirkton, Arbroath.

Peddie, William, 11 South Methven Street, Perth.
Primerose, Alfred, Dock Street, Dundee.

Reid, Gilbert Aitken, 22 Glover Street, Leith.
Robertson, Edgar W., of Auchleeks, Blair-Athole.
Robertson, Major James, United Service Club, Edinburgh.
Ross, Alexander, 66 Queen Street, Edinburgh.
Ross, Colonel Patrick Robertson, Potterhill, Perth.

[illegible], John, Curator, Royal Botanic Gardens, [illegible]dinburgh.
[illegible] James, Merchant, 5 Grassmarket, [illegible]dinburgh.
[illegible] James Addison, of Wooden, Kelso.
[illegible]n, J., Merchant, Perth.
[illegible] James, Torphin, Colinton.
[illegible]ld, Captain John, Dunninald, Montrose.
Steel, Adam, yr. of Blackpark, Perth.

Thomson, Andrew, 15 Inverleith Place, Edinburgh.

Waddell, Alexander, of Palace, Jedburgh.
Wallace, Thomas Alexander, Banker and Town-Clerk, Burntisland.
Watt, John, Drumgray, Airdrie.
Wemyss, David Watson, Newton Bank, St Andrews.
Wilson, George, jun., Dalveen, Thornhill.

DIPLOMA-HOLDERS—ELECTED FREE LIFE MEMBERS, 18TH JUNE 1879.

Aitken, John M., Crieff (24 St Andrew Square, Edinburgh).

Cannan, James, Urioch, Castle-Douglas.
Craig, John, Innergeldie, Comrie.

Hunt, A. E. Brooke (B.A., Trin. Col., Cam.), Peer's Court, Dursley, Gloucestershire.

Wilson, John, jun., Fairfield, Lorton, Cockermouth.

Number of Members in list published March 1879,	4840
Number of Members admitted in June 1879,	108
Number of Members admitted in January 1880,	64
Number of Holders of Agricultural Diploma admitted Free Life Members in June 1879,	5
	5017
Deduct estimated Deaths, &c.,	167
Total,	4850

EDINBURGH, 1*st March* 1880.

F. N. MENZIES, *Secretary*

INDEX.

Abies Albertiana, and its Value for Planting in Scotland, On the, by Robert Hutchison, 172.

Accounts. *See* Finance.

Agricultural Bursaries, Report of Examinations, Appendix A, 43.

Agricultural Class in Edinburgh University, Premiums awarded to Students, Appendix A, 77.

Agricultural Education, Letter from Secretary of Science and Art Department, Appendix A, 7—Report of Examinations, Appendix A, 23.

Agricultural Statistics, 323.

Agriculture of the County of Sutherland, by James Macdonald, 1.

Aitken, Dr A. P.: A Visit to Rothamsted, 238—The Agricultural Experiments at Woburn, 259—Experimental Stations, Report for 1879, 271—Reports by, at General Meetings, Appendix A, 22, 39.

Analysis, Instructions for selecting samples for, 302,—Dr Aitken authorised to make, for Members, Appendix A, 1, 4, 7, 21,—Privileges of Members regarding, Appendix A, 7, 21.

Archibald, David: On the Cheviot Breed of Sheep, 110.

Argyll Naval Fund, Report to General Meeting, 21st January 1880, Appendix A, 30—Abstract of Accounts for 1878–79, Appendix A, 84.

Ash Trees in Scotland, On the Old and Remarkable, by Robert Hutchison, 129.

Bandeath, On the Reclamation of Land from Moss on the Farm of Upper, by John Mackie, 189.

Buchan, Alexander: Meteorology of 1879, 317.

Butter, On the Different Methods of Making and Curing in this Country and Abroad, by John M'Culloch, 196.

Cereal and other Crops of Scotland for 1879, and Meteorology of the year in relation thereto, 304.

Charter of the Society, Motion by Mr Mollison as to Revision of, Appendix A, 10, 15, 26—Report to General Meeting, Appendix A, 41.

Chemical Department, Experimental Stations—Report for 1879, by Dr A. P. Aitken, 271—Instructions for selecting Samples for Analysis, 302—Proceedings in regard to, Appendix A, 1, 3, 4, 5, 6, 7, 10, 13, 22—Reports on, at General Meetings, Appendix A, 21, 24, 37—Note in regard to Chemist, Appendix B, 20.

Cheviot Breed of Sheep, On the, by David Archibald, 110.

Committees for 1880, Appendix B, 7.

Cottage Competitions, Report on, Appendix A, 41—Premiums awarded in 1879, Appendix A, 74—Premiums offered in 1880, Appendix B, 46.

Curror, Adam, The Lee, Death of, Appendix A, 2.

Denbrae, Fifeshire, Improvements on the Estate of, by David Watson Wemyss, 103.

Directors and other Office-Bearers for 1880, Appendix B, 5.

District Competitions, Report on, Appendix A, 41—Premiums awarded in 1879, Appendix A, 63—Premiums offered in 1880, Appendix B, 33.

Dumfries Show, 1878, Transference of Premiums, Appendix A, 9—Award of Premiums, Appendix A, 45.

Essays and Reports, Premiums awarded for, in 1879–80, Appendix A, 45—Premiums offered for, in 1880, Appendix B, 22.

Establishment for 1880, Appendix B, 5.

Examiners in Agricultural Education, Appendix B, 10—Veterinary Department, Appendix B, 17—Forestry Department, Appendix B, 19.

Experimental Stations, Report for 1879, by Dr A. P. Aitken, 271—Reports on, to General Meetings, Appendix A, 22, 39.

Experiments with Soluble and Insoluble Phosphates and Nitrogen on the Growth of Turnips, by Thomas Lawson, 90.

Finance:—State of the Funds at 30th November 1879, Abstract of the Accounts for 1878–79, Abstract of the Accounts of the Perth Show, 1879, and Accounts of

the Argyll Naval Fund, 1878–79, Appendix A, 79 to 84.
Forestry Department:—Board of Examiners, Syllabus of Examination, Appendix B, 19.
Frost, On the Effects of the Severe Frost and Winter of 1878-79 on Trees and Shrubs, by Robert Hutchison, 180.

Gaelic Manuscripts belonging to the Society, Appendix A, 2.
General Meeting at Annual Shows, Proceedings in regard to, Appendix A, 1, 3, 9, 28—Report of Meeting at Perth, 30th July, Appendix A, 24.
General Shows, Proceedings regarding the Circuit of, Appendix A, 1, 3, 9—Motion by Mr Greig in regard to the awards by the Machinery Committee at, Appendix A, 28—Report by Special Committee on the Circuit of, Appendix A, 31—Motion by Hon. George Waldegrave Leslie as to Exhibition of Poultry at, Appendix A, 36.
Glengloy, Inverness-shire, On Plantations on the Estate of, by George Grant Mackay, 193.

Hall and Chambers, Proceedings in regard to, Appendix A, 6, 7, 14, 18—Report to General Meeting, Appendix A, 40.
Highland and Agricultural Society, Proceedings at Board Meetings, 1879–80, Appendix A, 1—Proceedings at General Meeting, 18th June 1879, Appendix A, 17—Perth, 30th July 1879, Appendix A, 24—January 1880, Appendix A, 29.
Hunter, James W., of Thurston, Death of, Appendix A, 2.
Hutchison, Robert: On the Old and Remarkable Ash Trees in Scotland, 129—On the Old and Remarkable Sycamores in Scotland, 150—On the *Abies Albertiana* and its Value for Planting in Scotland, 172—On the Effects of the Severe Frost and Winter of 1878–79 on Trees and Shrubs, 180.

Implements Selected for Trial, Reports on, Appendix A, 6.
Improvements on the Estate of Denbrae, Fifeshire, by David Watson Wemyss, 103.

Judges, List of, at Perth Show, 1879, Appendix A, 62.

Kelso Show, 1880, Proceedings in regard to, Appendix A, 5, 9, 12, 15, 18, 30.
Kilburn Show, Deputation to, Appendix A, 8—Report by Deputation to, Appendix A, 11.

Labour, On providing a sufficient supply of, during press of Agricultural Work, by John M'Culloch, 229.
Lawson, Thomas: On Experiments with Soluble and Insoluble Phosphates and Nitrogen on the Growth of Turnips, 90.

M'Culloch, John: On the Different Methods of Making and Curing Butter in this Country and Abroad, 196—On Providing a sufficient supply of labour during press of Agricultural Work, 229.
Macdonald, James: On the Agriculture of the County of Sutherland, 1.
Mackay, George Grant: On Plantations on the Estate of Glengloy, Inverness-shire, 193.
Mackie, John: On the Reclamation of Land from Moss on the Farm of Upper Bandeath, Stirlingshire, 189.
Manures, Experiments with Soluble and Insoluble Phosphates and Nitrogen on the Growth of Turnips, by Thomas Lawson, 90.
Manures and Feeding Stuffs, Action of the Society to protect Members against fraudulence in, Appendix A, 7, 21.
Members, List of, Admitted since January 1879, Appendix B, 74.
Meteorology of 1879, 317.

Office-Bearers of the Society for 1880, Appendix B, 5.

Perth Show, 1879, Account of, 263—Proceedings in regard to, Appendix A, 2, 3, 5, 8, 9, 17, 30—Discovery of False Hair on a Prize Filly, Appendix A, 35—Premiums awarded, Appendix A, 45—Judges and Attending Members, Appendix A, 62.
Plantations on the Estate of Glengloy, Inverness-shire, by George Grant Mackay, 193.
Ploughing Competitions, List of, held in 1878–79, Appendix A, 72—Regulations for, Appendix B, 45.
Potato Planters, Report of Trial of, Appendix A, 6.
Premiums awarded by the Society in 1879, Appendix A, 45—Offered by the Society in 1880, Appendix B, 22.
Proceedings at Board Meetings of the Society, 1879–80, Appendix A, 1.
Proceedings at General Meetings of the Society, June 1879, Appendix A, 17—Perth, 30th July 1879, Appendix A, 24—January 1880, Appendix A, 29.

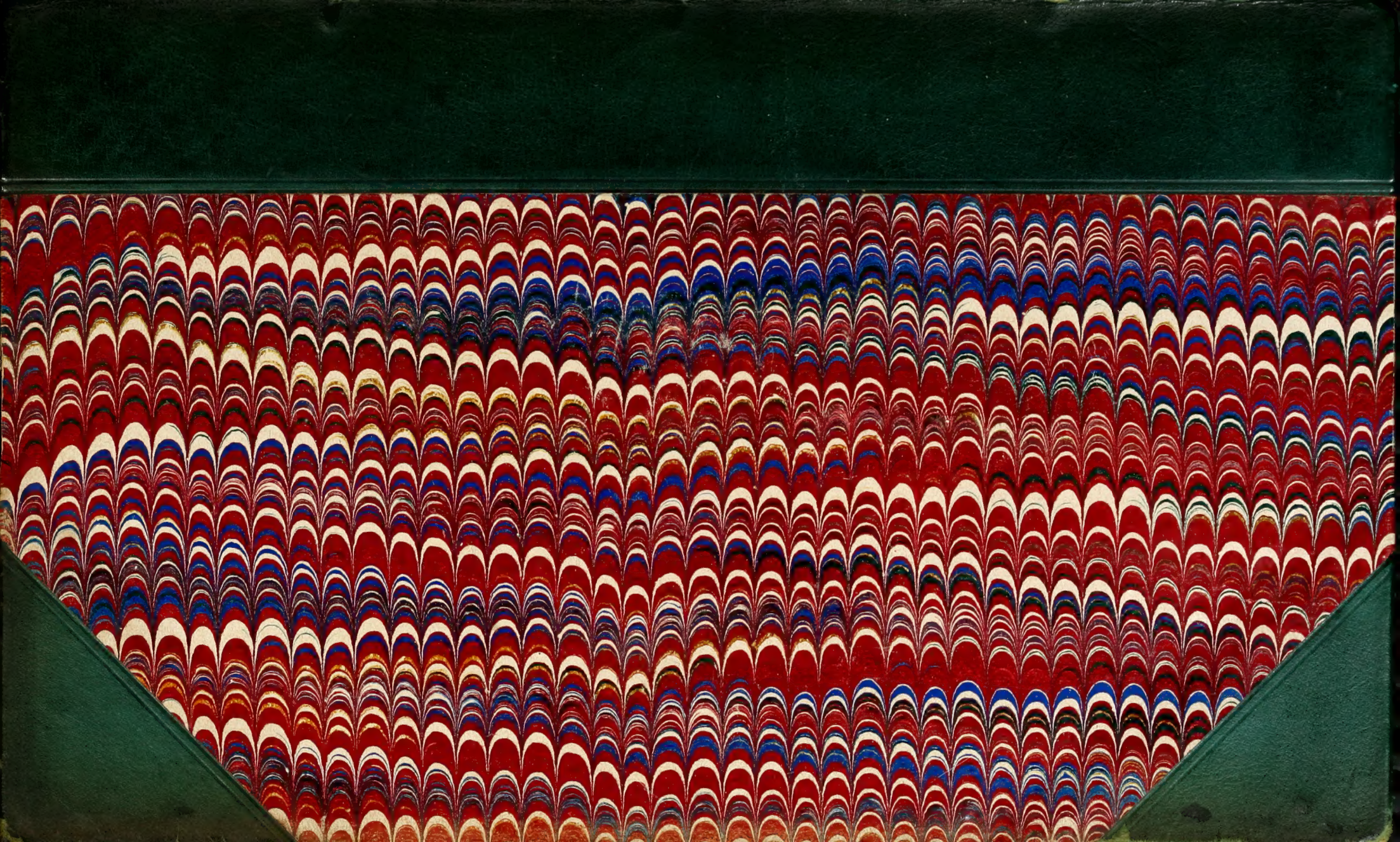
Replanting of Woodlands, by Thomas Wilkie, 221.
Rothamsted, A Visit to, by Dr A. P. Aitken, 238.
Roxburghe, The Duke of, Death of, Appendix A, 6.

Scaling, William, Letter from, on the Cultivation of Willows, Appendix A, 4.
Sheep, On the Cheviot Breed of, by David Archibald, 110.
Statistics (Agricultural), 323.
Stirling Show, 1881, Proceedings in regard to, Appendix A, 9, 12, 15, 30.
Sutherland, on the Agriculture of the County of, by James Macdonald, 1.
Sycamores in Scotland, On the Old and Remarkable, by Robert Hutchison, 150.

Tod, Captain, of Howden, Death of, Appendix A, 6.
Transactions: Mode of procuring Papers for Publication, Appendix A, 1, 3—Report by Special Committee, Appendix A, 42—Discussion regarding Readers of Reports, Appendix A, 43.
Trees and Shrubs, On the Effects of the Severe Frost and Winter of 1878–79, by Robert Hutchison, 180.
Trial of Implements, Report on, Appendix A, 6.
Turnips, Experiments with Soluble and Insoluble Phosphates and Nitrogen on the Growth of, by Thomas Lawson, 90.

Veterinary Department:—Report to General Meeting, Appendix A, 24—Report of Examinations, Appendix A, 13—Medals awarded to Students, Appendix A, 77—Note as to the Institution of the Veterinary Department, Board of Examiners, Syllabus of Examinations, and Agreement between the Society and the Royal College of Veterinary Surgeons, Appendix B, 13 to 18.

Waste Land, On the Reclamation of Land from Moss on the Farm of Upper Bandeath, by John Mackie, 189.
Wemyss, David Watson: On Improvements on the Estate of Denbrae, Fifeshire, 103.
Wightman, James Seton, of Courance, Death of, Appendix A, 8.
Wilkie, Thomas: On the Replanting of Woodlands, 221.
Willows, Cultivation of, Letter from William Scaling on, Appendix A, 4.
Woburn, The Agricultural Experiments at, by Dr A. P. Aitken, 259.
Woodlands, On the Replanting of by Thomas Wilkie, 221.

PRINTED BY NEILL AND COMPANY, EDINBURGH.

New York Botanical Garden Library
3 5185 00267 4669